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EVALUATION OF A 6.5 INCH DIA. MODEL HYDROSTATIC STERN TUBE BEARING

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Un sommaire en français de ce rapport est inclus avant la Table des matières.

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17 Abstract

An evaluation of a 6.5" dia. X 7.5" long hydrostatic bearing is presented, based on a test program conducted at the Naval Engineering Test Establishment, LaSalle, Quebec. A complete record of test data is provided. The bearing was designed to model in one-fifth scale the peripheral shaft velocities, pressures and shaft/bearing clearance conditions that would apply for a stern bearing intended for large tonnage marine carriers. Test data is included for two variations of the bearing: the original design and a modification to this design that reduced the water escape area, thereby increasing the effective support area.

A graphical presentation of the load/pressure/flow/displacement characteristics of the modified bearing under applied loads from 1,000 to 8,000 lb. is included.

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17 Résumé

Ce rapport présente l'évaluation d'un palier hydrostatique ayant un diamètre de 6,5 po et une longueur de 7,5 po, au terme d'un programme d'essais réalisé au Centre d'essais techniques (Mer) de LaSalle, Québec, et dont tous les résultats sont fournis. Le palier a été réalisé afin d'étudier à l'échelle un cinquième les paramètres de fonctionnement - vitesse périphérique de l'arbre, pression et jeu radial - des paliers de tube d'étambot devant équiper les navires de fort tonnage. Les données d'essais concernent deux variantes du palier, c'est-à-dire le modèle original et une version modifiée pour réduire la surface de fuite du lubrifiant utilisé et ainsi augmenter la portée efficace du palier.

Un graphique est présenté mettant en relation les caractéristiques de portance, de pression, de débit et de résistance du palier modifié, sous une gamme de charges allant de 1 000 à 8 000 livres.

18 Mots-clés

Palier hydrostatique, palier de tube d'étambot, palier à source de mise en pression extérieure

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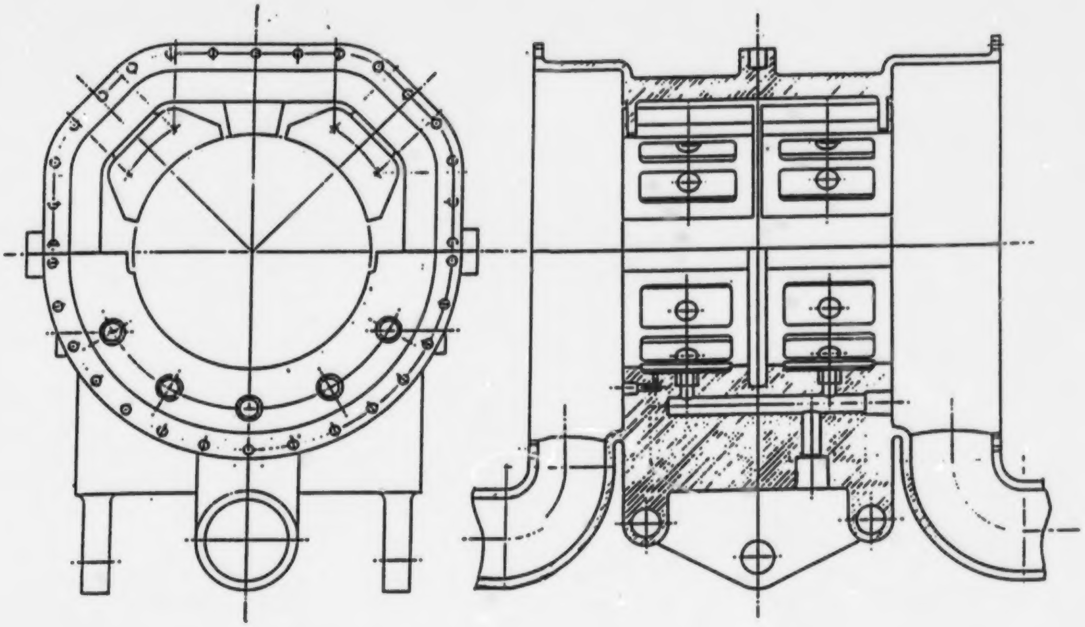
SUMMARY



THE MODEL HYDROSTATIC BEARING

RATED LOAD:	5275 lb
SHAFT SPEED:	553 rpm (940 peripheral ft/min)
SHAFT DIAMETER:	6.5 inches
BEARING LENGTH/DIA.	1.15:1
WORKING MEDIUM:	FRESH/SEA WATER

1. GENERAL

This report provides an evaluation of a 6.5" dia. by 7.5" long hydrostatic bearing based on tests conducted at the Naval Engineering Test Establishment, LaSalle, Quebec. The report includes a complete record of the test data. The bearing was designed by R.H.F. Dillon to model, in one-fifth scale, the peripheral shaft velocities, pressures and shaft/ bearing clearance conditions that would apply for a stern tube bearing intended for large tonnage marine carriers. The bearing on which the model was based is the subject of a patent accorded to R.H.F. Dillon (U.S. Patent 4,005,916 - February 1st, 1977).

2. BEARING

The model bearing consists of top and bottom halves machined from bronze castings, bolted together on a dowelled face to face horizontal joint. The lower half is a partial bearing of 160 degrees arc in which are cast two circumferential rows of five shallow flat-bottomed recesses into which water under pressure is supplied. A thread is tapped in the supply drilling to each recess to receive a flow-metering orifice of 0.1350" diameter. The vertical rise of the shaft is limited by two pairs of pads located in the top half of the bearing, machined to the same curvature as the lower partial bearing. Two shallow flat-bottomed recesses are cast into each pad into which water under pressure is supplied. Orifices fitted into the supply connections of these pads are 0.0718" diameter. Each pad incorporates a piston that fits into a cylinder bored radially into the top half of the assembly. The four cylinders are positioned, two on each side, at an angle of 45 degrees to the vertical. The pistons are loaded with water under pressure through connections to the cylinder heads and are equipped with check valves. Each head is provided with a connection for a small cushioning air vessel and a bleed valve. With the shaft concentric in the bearing, the radial clearance is 0.002 inches. The bearing is mounted in trunnions permitting it to pivot and align itself with the shaft in the vertical plane. Clearance is provided in the trunnion assembly to permit some freedom for the bearing to align itself laterally with the shaft.

3. TEST RIG

The bearing was loaded by weights and calibrated springs through a triple loading mechanism on a roller bearing mounted on an extension to the shaft, to achieve a mechanical advantage of 24:1.

The pump discharge pressure was controlled by a manual bypass valve and a back pressure regulator. Water was delivered to three manifolds supplying the pistons, the lower bearing and the upper bearing shoes. Supply pressures to the pistons and lower bearing were maintained approximately equal. The pressure in the upper bearing manifold was further reduced by a separate reducing valve. Tests were conducted using two different pumps with different pressure/flow characteristics. Both fresh water and sea water were employed.

Instrumentation was incorporated in the bearing and test rig to record flows, pressures, water temperatures, shaft rpm, displacement of the shaft axis from the bearing axis and vibration. Initially, data was recorded manually. After the first twelve test series, it was recorded by a data logger.

4. TEST PROGRAMME

Twenty series of tests were undertaken including steady and impulsive loading imposed vertically and horizontally. The first nine series of tests were conducted on the model bearing as originally designed. The subsequent eleven series of tests were undertaken following a modification to the bottom half of the bearing in which the fluid escape area was reduced and the effective support area thereby increased. The final series of tests were designed to establish the load/float/pressure/flow relationships of the modified bearing.

5. TEST RESULTS

The following summarizes the main findings of the project:

a) Shaft Rotation

Rotation of the shaft made no measurable difference to the performance ot the bearing under any conditions of loading up to the rated speed of 553 rpm.

b) Fresh Water versus Sea Water

The different densities and viscosities of fresh water and sea water had no measurable effect on the bearing's performance.

c) Impulsive Loading

The bearing's performance under impulsively applied vertical loads up to 5 Hz and horizontal loads up to 4 Hz was not measurably different to its performance under steady loads of the same magnitude.

d) Coefficient of Friction

Coefficients of friction, which were intermediate in value between those typical of ball and roller bearings, did not change appreciably under any condition of loading.

e) Conditions of the Bearing Surfaces after the Tests

There was only the slightest evidence of contact between the shaft and bearing surfaces. This would have occurred under the very high load imposed when exploring the bearing's ultimate load-carrying capacity. Small isolated deposits of calcium salts were found on the surfaces.

f) Alignment

The trunnion mechanism on which the bearing was mounted permitted correction of shaft/bearing misalignment in the vertical plane to within 0.0006 inches approximately, as recorded at the forward and after ends of the bearing.

The inability of the mounting mechanism to rotate in the horizontal plane, coupled with the low pressure losses across the orifices of the lower bearing, in relation to the pressure losses across the bearing, resulted in shaft/ bearing misalignment in the horizontal plane. A degree of skew between the shaft and bearing in the horizontal plane was detected which, together with minor extraneous forces resulted in a reduction of the nominal clearance on the port side of 40% to 60%. It would appear, therefore, that there was metallic contact between the bearing and shaft below recorded bottom clearances of 0.0005 inches as measured under non-rotating conditions.

g) Original Bearing - Maximum Vertical Overload

A maximum of 165% of the rated vertical total load of 5275 lb was supported by the original bearing with a shaft displacement of 1.0 thou when supplied with water at 248 psig.

h) Modified Bearing - Maximum Vertical Overload

A maximum of 200% of the rated vertical total load of 5275 lb was supported by the modified bearing whilst maintaining the nominal design clearance of 2.0 thou when supplied with water at 239 psig.

i) Modified Bearing - Maximum Lateral Load

Whilst maintaining the rated vertical total load of 5275 lb, the modified bearing supported a maximum lateral load of 14.5% of the rated vertical load, whilst maintaining a lateral clearance of 0.15 thou when supplied with water at 145 psig.

j) Operating Parameters

The following aquations characterize the modified bearing within the clearance range of 0.001 to 0.002 inches and constant applied loads from 1000 lb to 8000 lb:

Constant Load Curves:

At 8000 lb: $P = 183.1 + 1.47\,Q$

At 6000 lb: $P = 159.0 + 1.68\,Q$

At 4000 lb: $P = 119.4 + 1.80\,Q$

At 2000 lb: $P = 78.1 + 2.04\,Q$

At 1000 lb: $P = 44.3 + 3.32\,Q$

The following general equation is recommended for the purpose of plotting load curves. It is particularly accurate for loads between 2000 lb and 6000 lb:

$$P = 0.8198\ L^{x} + (7.815/L^{y})\ Q$$

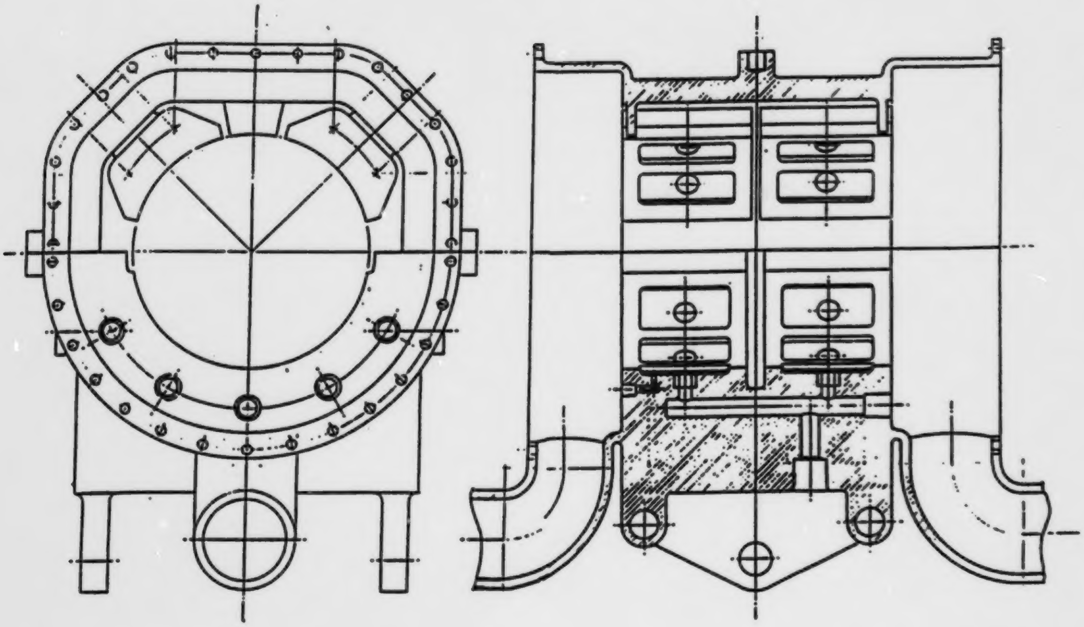
In the above expression, L is the applied load in lb, x is 0.5995 and y is 0.1767

Constant Float Curves:

At 2.0 thou: $P = 1.6\ Q^2$
At 1.5 thou: $P = 2.5\ Q^2$
At 1.0 thou: $P = 4.7\ Q^2$

where P is the average of the pressures in the centre and outer recesses (psig) and Q is the total flow to the bottom recesses (igpm).

SOMMAIRE



CARACTÉRISTIQUES DU MODÈLE RÉDUIT DE PALIER HYDROSTATIQUE

CHARGE NOMINALE	5 275 lb
VITESSE DE ROTATION DE L'ARBRE	553 tr/min (vitesse périphérique de 940 pi/min)
DIAMETRE DE L'ARBRE	6,5 po
RAPPORT LONGUEUR/ DIAMETRE DU PALIER	1,15:1
FLUIDE LUBRIFIANT	EAU DOUCE/EAU DE MER

1. GÉNÉRALITÉS

Ce rapport présente l'évaluation d'un palier hydrostatique ayant un diamètre de 6,5 po et une longueur de 7,5 po, au terme d'un programme d'essais réalisé au Centre d'essais techniques (Mer) de LaSalle, Québec. Ce document comprend tous les résultats des essais. Le palier hydro statique a été conçu par R.H.F. Dillon pour simuler, à l'échelle un cinquième, les vitesses périfériques d'arbre, les pressions et les jeux radiaux qui devraient caractériser le fonctionnement des paliers de tube d'étambot sur les navires de fort tonnage. Le palier que simule le modèle réduit a fait l'objet d'un brevet délivré à R.H.F. Dillon (U.S. Patent 4 005 9116 - 1er février 1977).

2. DESCRIPTION DU PALIER

Le modèle réduit est formé de deux demi-coquilles à joint horizontal métal contre métal moulées en bronze et usinées, leur assemblage étant réalisé à boulons et goujons. La demi-coquille inférieure se présente sous la forme d'un palier partiel faisant 160^{o} d'arc et comportant deux rangées de cinq alvéoles de faible profondeur et à fond plat répartis sur sa périphérie et alimentés en eau sous pression. L'ajutage d'alimentation de chaque alvéole est taraudé pour recevoir une résistance hydraulique, de type orifice, ayant un diamètre de 0.1350 po. Le soulèvement vertical de l'arbre est limité par deux paires de patins logés dans la demi-coquille supérieure et usinés à la meme courbure que la demi-coquille inférieure. Chaque patin comporte deux alvéoles peu profonds à fond plat, également alimentés en eau sous pression. Les résistances hydrauliques placées dans les ajutages d'alimentation de ces alvéoles ont 0.0718 po de diamètre. Chaque patin est appliqué contre l'arbre au moyen d'un piston logé dans un alésage radial pratiqué dans la demi-coquille supérieure du palier. Les quatre pistons sont placés, deux à deux, de chaque côté de l'axe de symétrie du palier, à un angle de 45^{o} par rapport à la verticale. Ils sont maintenus sous charge par de l'eau sous pression arrivant par une canalisation munie d'un clapet de non-retour, d'une chambre d'air et d'un robinet de purge. Lorsque l'arbre est parfaitement centré dans le palier, le jeu radial est de 0,002 pouce. Le palier étant monté sur pivot, il peut suivre l'alignement de l'arbre dans le plan vertical; et comme un certain jeu a été prévu dans le montage à pivot, le palier peut également s'ajuster à un certain décalage latéral de l'arbre.

3. APPAREILLAGE D'ESSAI

La mise en charge du palier a été réalisée au moyen de poids et de ressorts étalonnés dans un mécanisme à trois bras agissant par l'intermédiaire d'un palier à roulement monté sur une extension de l'arbre et développant un avantage mécanique de 24:1.

La pression de refoulement de la pompe se réglait au moyen d'un robinet de dérivation à commande manuelle et d'un régulateur à contre-pression. L'eau était dirigée vers trois collecteurs alimentant respectivement les pistons, les alvéoles des patins de centrage et ceux de la demi-coquille inférieure. Les pressions d'alimentation des pistons et des alvéoles de la demi-coquille inférieure étaient maintenus à peu près égales. Quant à la pression d'alimentation des alvéoles des patins de centrage, elle a été ramenée à une valeur inférieure au moyen d'un réducteur de pression distinct. Les essais ont été réalisés avec deux pompes affichant des courbes caractéristiques de pression-débit différentes. Le fluide lubrifiant utilisé était tantôt de l'eau douce, tantôt de l'eau de mer.

L'instrumentation montée dans le palier lui-même et sur l'appareillage d'essai a servi à enregistrer les débits, pressions et températures de l'eau, la vitesse de rotation de l'arbre, les déplacements de l'arbre à l'intérieur du palier ainsi que les vibrations. Au début, la lecture des instruments était faite par un opérateur mais, après les douze premières séries d'essais, la tâche a été confiée à un enregistreur automatique.

4. PROGRAMME D'ESSAIS

Vingt séries d'essais ont été réalisées, parmi lesquelles des essais de charge statique et de charge dynamique ou pulsée dans les axes vertical et horizontal. Les neuf premières séries ont été faites sur le modèle original et les onze suivantes sur la version modifiée dont la surface de fuite a été réduite dans la coquille inférieure pour augmenter la surface portante effective. La dernière série d'essais avait pour but d'établir les relations entre charge, épaisseur de film, pression et écoulement du palier modifié.

5. RÉSULTATS

Voici les principaux résultats de la recherche:

a) Rotation de l'arbre

La vitesse de rotation poussée jusqu'à la valeur nominale de 553 tr/min a eu un effet negligeable sur le comportement du palier dans toutes les conditions de charge essayées.

b) Choix du fluide lubrifiant

Les différentes valeurs de densité et de viscosité de l'eau douce et de l'eau de mer utilisées n'ont eu aucun effet mesurable sur le comportement du palier.

c) Charges dynamiques ou pulsées

Le comportement du palier soumis à des charges verticales pulsées de fréquence maximum 5 Hz et à des charges horizontales telles que maximum 4 Hz accusait d'une différence négligeable par rapport à celui sous charge statique de même amplitude.

d) Coefficient de frottement

Les coefficients de frottement mesurés, qui se situent entre les valeurs caractéristiques des roulements à billes et à rouleaux, n'ont pas varié de façon sensible dans toute la gamme des charges d'essais imposées.

e) Etat de surface du palier après les essais

Les traces de contact arbre/palier étaient tout à fait minimes; elles sont sans doute attribuables aux charges extrêmes imposées lors des essais aux conditions limites. De petits dépôts isolés de calcium ont également été notés.

f) Alignement

Le montage à pivot du palier autorisait une compensation du mésalignement de l'arbre dans le plan vertical à

0,0006 po près, d'après les mesures micrométriques faites aux deux bouts du palier.

L'absence de liberté de rotation dans le plan horizontal, couplée aux pertes de charge dans les résistances hydrauliques de la demi-coquille inférieure, qui sont faibles devant les pertes de charge dans le palier entier, était à l'origine d'un mésalignement du palier par rapport à l'arbre dans le plan horizontal. Ce mésalignement, auquel s'ajoutait l'effet de forces extérieures de faible valeur, a entraîné une réduction du jeu nominal côté tribord dans un proportion de 40 à 60%. Il semble donc qu'il y ait eu contact métal-métal entre le palier et l'arbre lorsque le jeu en fond de palier tombait sous 0.0005 po, mesuré dans des conditions stationnaires.

g) Modèle original - Surcharge verticale maximum

Alimenté en eau sous une pression manométrique de 248 lb/po^2, le palier original a résisté à un maximum de 165% de la charge verticale de service (5 275 lb) pour un déplacement de l'arbre de 0,001 po.

h) Palier modifié - Surcharge verticale maximum

Alimenté sous une pression manométrique de 239 lb/po^2, le palier modifié a supporté 200% de la charge verticale de service (5 275 lb) sans réduction aucune du jeu nominal de 0,002 po.

i) Palier modifié - Charge latérale maximum

Alimenté sous une pression manométrique de 145 lb/po^2 et soumis à la charge verticale de service de 5 275 lb, le palier modifié a supporté une charge latérale égale à 14,5 % de la charge verticale de service tout en maintenant un jeu radial latéral de 0,00015 po.

j) Paramètres de fonctionnement

Les équations ci-dessous représentent les conditions de fonctionnement du palier modifié pour un jeu en fond de palier compris entre 0,001 et 0,002 po et des charges statiques variant entre 1 000 et 8 000 lb.

Courbes caractéristiques sous charge constante:

à 8 000 lb: $P = 183{,}1 + 1{,}47\ Q$
à 6 000 lb: $P = 159{,}0 + 1{,}68\ Q$
à 4 000 lb: $P = 119{,}4 + 1{,}80\ Q$
à 2 000 lb: $P = 78{,}1 + 2{,}04\ Q$
à 1 000 lb: $P = 44{,}3 + 3{,}32\ Q$

L'équation générale suivante est recommandée pour le calcul des courbes caractéristiques sous charge. Elle donne des résultats particulièrement précis entre 2 000 et 6 000 lb:

$$P = 0{,}8198\ L^{x} + (7{,}815/L^{y})\ Q$$

L est la charge appliquée en livres, x est égal à 0,5995 et y à 0,1767.

Courbes caractéristiques à épaisseur de film constante:

à 0,0020 po: $P = 1{,}6\ Q^2$
à 0,0015 po: $P = 2{,}5\ Q^2$
à 0,0010 po: $P = 4{,}7\ Q^2$

P étant la moyenne des pressions dans les alvéoles médians et extérieurs (en lb/po^2) et Q étant le débit total aux alvéoles de la demi-coquille inférieure (en gal.imp./min).

TABLE OF CONTENTS

VOLUME I
Page

1. INTRODUCTION 1
   1.1 General 1
   1.2 Design Objectives 1
   1.3 Layout of the Report 2
   1.4 Terminology - Definitions 3
   1.4.1 Shaft/Bearing Displacement 3
   1.4.2 Total and Applied Loads 4
   1.4.3 Rated Load and Overload 4
   1.4.4 Rated Speed 4
   1.4.5 Coefficient of Friction 5

2. TEST BEARING AND SHAFT 7
   2.1 General Description 7
   2.2 Shaft and Bearing Materials 8
   2.3 Modification to Lower Bearing 8
   2.4 Test Rig Conditions and Real Operating Conditions 9
   2.4.1 Water Escape Conditions 9
   2.4.2 Alignment of Bearing with Shaft 9

3. TEST RIG 11
   3.1 General 11
   3.2 Loading Mechanism 11
   3.2.1 Calculationg of Total, Rated and Applied Load 12
   3.2.2 Application of Impulsive Loads 12
   3.3 Calculation of Coefficient of Friction 13
   3.4 Test Rig Water System 13
   3.5 Instrumentation 14
   3.5.1 Flows 14
   3.5.2 Pressures 15
   3.5.3 Temperatures 15
   3.5.4 Shaft Speed 15
   3.5.5 Shaft Displacement 16
   3.5.6 Shaft Vibration 16
   3.6 Accuracy of the Instrumentation 16

4. TEST CONDITIONS 19
   4.1 Intentions of the Test Programme 19
   4.2 Conditions Imposed during Testing 21

5. TEST PROCEDURES AND RESULTS 25
   5.1 Test Series 1 - Preliminary Tests, Pistons removed from Top Half 25
   5.1.1 - Objectives 25
   5.1.2 - Results 25
   5.1.3 - Discussion of Results 26
   5.2 Test Series 2 - Rated Load, Increasing Speed, No Orifices 28
   5.2.1 - Objectives 28
   5.2.2 - Results 28
   5.2.3 - Discussion of Results 29

5.3 Test Series 3 - Rated Load, Increasing Speed, Orifices 29
5.3.1 - Objectives 29
5.3.2 - Results 30
5.3.3 - Discussion of Results 30
5.4 Test Series 4 - Rated Load, Increasing Speed, Cold and Warm Sea Water 31
5.4.1 - Objectives 31
5.4.2 - Results 31
5.4.3 - Discussion of Results 31
5.5 Test Series 5 - Increasing Overload, No Orifices, Fresh Water, Shaft Stopped 31
5.5.1 - Objectives 31
5.5.2 - Results 32
5.5.3 - Discussion of Results 32
5.6 Test Series 6 - Increasing Overload, Orifices, Sea Water, Shaft Stopped 32
5.6.1 - Objectives 32
5.6.2 - Results 32
5.6.3 - Discussion of Results 33
5.7 Test Series 7 - Increasing Overload, Orifices, Constant Speed 33
5.7.1 - Objectives 33
5.7.2 - Results 34
5.7.3 - Discussion of Results 34
5.8 Test Series 8 - Increasing Overload, Shaft Stopped, PACO Pump 34
5.8.1 - Objectives 34
5.8.2 - Results 34
5.8.3 - Discussion of Results 35
5.9 Test Series 9 - Rated Loads and Constant Overloads, Increasing Speeds, PACO Pump 38
5.9.1 - Objectives 38
5.9.2 - Results 38
5.9.3 - Discussion of Results 39
5.10 Test Series 10 - Rated Load and Overload, Modified Bottom Half Bearing 40
5.10.1 - Objectives 40
5.10.2 - Results 40
5.10.3 - Discussion of Results 41
5.11 Test Series 11 - Rated Vertical and Increasing Lateral Load, Shaft Stopped 42
5.11.1 - Objectives 42
5.11.2 - Results 42
5.11.3 - Discussion of Results 43
5.12 Test Series 12 - Rated Vertical and Increasing Lateral Load, Constant rpm 43
5.12.1 - Objectives 43
5.12.2 - Results 43
5.12.3 - Discussion of Results 44
5.13 Test Series 13 - Rated Vertical and Impulsive Lateral Load, Constant rpm 44
5.13.1 - Objectives 44
5.13.2 - Results 44
5.13.3 - Discussion of Results 44

5.14 Test Series 14 - Increasing Vertical Overload,
Shaft Stopped 46
5.14.1 - Objectives 46
5.14.2 - Results 46
5.14.3 - Discussion of Results 46
5.15 Test Series 15 - Increasing Vertical Overload, 46
Shaft Running 46
5.15.1 - Objectives 46
5.15.2 - Results 47
5.15.3 - Discussion of Results 47
5.16 Test Series 16 - Constant Impulsive Vertical Overload,
Constant Speed 47
5.16.1 - Objectives 47
5.16.2 - Results 47
5.16.3 - Discussion of Results 47
5.17 Test Series 17 - Impulsive Vertical Overload
with Air Vessels of Increasing Size 48
5.17.1 - Objectives 49
5.17.2 - Results 49
5.17.3 - Discussion of Results 49
5.18 Test Series 18 - Vibration Readings of Bearing 49
5.19 Test Series 19 - Torque Tests 50
5.19.1 - Objectives 50
5.19.2 - Results 50
5.19.3 - Discussion of Results 52
5.20 Test Series 20 - Investigation into the Characteristics
of the Modified Bearing 52
5.20.1 - Objectives 52
5.20.2 - Results 52
5.20.3 - Discussion of Results 52

6. BEARING INSPECTIONS DURING AND AFTER TESTING 71
6.1 Inspections During Testing 71
6.2 Inspections After Testing 71

7. SUMMARY AND DISCUSSION OF THE TEST RESULTS 73
7.1 General 73
7.2 Bearing Performance - General 75
7.2.1 Higher Top Manifold Pressure Setting 75
7.2.2 Lower Top Manifold Pressure Setting 75
7.2.3 Modification to Increase Load-Supporting Area 76
7.2.4 Shaft Rotation 76
7.2.5 Fresh Water Versus Sea Water 76
7.2.6 Impulsive Loading 76
7.2.7 Coefficient of Friction 76
7.2.8 Condition of the Bearing Surfaces after the Tests 76
7.2.9 Effect of Air Vessels 77
7.3 Characteristics of Bottom Half Orifices 77
7.3.1 Flow Division between Forward and After Recesses 77
7.3.2 Unmodified Bearing - Test Series 4A, 8 and 9
Orientation of the Shaft in the Bearing
Flow Distribution 2 78

7.4 Modified Bearing - Recess Flows and Pressure Drops 79
7.4.1 Orientation of the Shaft in the Bearing Outer Orifice Flow Distribution 80
7.4.2 Modified Bearing - Orientation of the Shaft at Two Thou Float 82
7.4.3 Modified Bearing - Locus of the Shaft Axis 82
7.4.4 Influence of the Lateral Position of the Shaft on Total flow through the Recesses 83
7.5 Modified Bearing - Factors Affecting the Lateral Position of the Shaft as it Rises in the Bearing 84
7.5.1 Lateral Thrusts due to Hydraulic Pressures 84
7.5.2 Lateral Thrust due to Show Pressures Effect of Starboard After Shoe 85
7.5.3 Lateral Thrusts due to Mechanical Forces 87
7.6 Modified Bearing Magnitude of the Lateral Mechanical Load 88
7.7 Modified Bearing - Performance Characteristics 89
7.7.1 Performance Evaluation 90
7.7.2 Performance Definition 93

APPENDICES

A. The Characteristics of the Kobe and Paco pumps
B. Oscilloscope Photographs
C. Bearing Inspection Reports
D. Drawings of the Bearing and Test Rig prepared at N.E.T.E.
E. Drawings of the Loading Mechanism
F. Monitoring Points, Data Logger Channels and Measurement System
G. Equipment and Instrumentation List
H. Photographs

BIBLIOGRAPHY

LIST OF FIGURES

		VOLUME I Page
Figure 1	Shaft Load and Float for Different Manifold Pressure/Flow Conditions	27
Figure 2a	Shaft Vibration Levels at 114 rpm Steady Vertical Overload - Vertical	53
Figure 2b	Shaft Vibration Levels at 347 rpm Steady Vertical Overload - Vertical	55
Figure 2c	Shaft Vibration Levels at 555 rpm Steady Vertical Overload - Vertical	57
Figure 2d	Shaft Vibration Levels at 114 rpm Steady Vertical Overload - Lateral	59
Figure 2e	Shaft Vibration Levels at 347 rpm Steady Vertical Overload - Lateral	61
Figure 2f	Shaft Vibration Levels at 555 rpm Steady Vertical Overload - Lateral	63
Figure 2g	Shaft Vibration Levels at 114 rpm Steady Vertical Overload - Longitudinal	65
Figure 2h	Shaft Vibration Levels at 347 rpm Steady Vertical Overload - Longitudinal	67
Figure 2i	Shaft Vibration Levels at 555 rpm Steady Vertical Overload - Longitudinal	69
Figure 3	Test Series 3, 4, 6 and 7. Unmodified Bearing. Orifice Pressure Drop versus Recess Flow for Increasing Flows. Plot coded by Shaft Float.	95
Figure 4	Test Series 3, 4, 6 and 7. Unmodified Bearing. Orifice Pressure Drop versus Recess Flow for Increasing Flows. Plot coded by Test Series.	97
Figure 5	Test Series 3, 4B, 6 and 7. Unmodified Bearing. Flow Distribution between Pairs of Recesses as Shaft Rises with Increasing Recess Flows.	99
Figure 6	Test Series 4A, 8 and 9. Unmodified Bearing. Flow Distribution between Pairs of Recesses as Shaft Rises with Increasing Recess Flows.	101
Figure 7	Test Series 20.3B. Modified Bearing under 3000 lb Applied Load. Orifice Pressure Drop versus Recess Flow for Increasing Flows.	103

Figure 8 Test Series 20.6B. Modified Bearing under 6000 lb Applied Load. Orifice Pressure Drop versus Recess Flow for Increasing Flows. 105

Figure 9 Test Series 20.9B. Modified Bearing under 9000 lb Applied Load. Orifice Pressure Drop versus Recess Flow for Increasing Flows. 107

Figure 10 Test Series 20.3B. Modified Bearing under 3000 lb Applied Load. Flow Distribution between Pairs of Recesses as Shaft Rises with Increasing Recess Flows 109

Figure 11 Test Series 20.6B. Modified Bearing under 6000 lb Applied Load. Flow Distribution between Pairs of Recesses as Shaft Rises with Increasing Recess Flows 111

Figure 12 Test Series 20.9B. Modified Bearing under 9000 lb Applied Load. Flow Distribution between Pairs of Recesses as Shaft Rises with Increasing Recess Flows 113

Figure 13 Test Series 20.1B, 2B, 3B, 4B, 5B, 6B, 7B, 8B, 9B. Modified Bearing under Loads from 1,000 to 9,000 lb. Flow Distribution at all Loads between Pairs of Recesses with Shaft at or above Concentricity in Bearing. 115

Figure 14 Lateral Displacement of the Rising Shaft. Applied Loads: 9000, 6000 and 3000 lb. 117

Figure 15 Lateral Hydraulic Thrusts on the Rising Shaft. Applied Load: 3000 lb. 119

Figure 16 Lateral Hydraulic Thrusts on the Rising Shaft. Applied Load: 6000 lb. 121

Figure 17 Lateral Hydraulic Thrusts on the Rising Shaft. Applied Load: 9000 lb. 123

Figure 18 Pressures Exerted by Shoes on Rising Shaft. Applied Load: 6000 lb. 125

Figure 19 Test Series 20. Modified Bearing. Bottom Manifold Pressures and Average Recess Pressures for Various Constant Applied Loads. 127

LIST OF TABLES

VOLUME II
Page

Table 0.1 Summary of Conditions Imposed During Each Series of Tests 1

Table 1.0 Conditions for Test Series 1
PRELIMINARY TESTS, PISTONS REMOVED FROM TOP HALF 3
Table 1.1 Results of Tests 34A to 34G 4
Table 1.2 Results of Tests 35A to 35G 5
Table 1.3 Results of Tests 36A to 36G 6
Table 1.4 Results of Tests 37A to 37G 7
Table 1.5 Results of Tests 38A to 38G 8
Table 1.6 Results of Tests 39A to 39G 9
Table 1.7 Summary of Results from Tables 1.1 to 1.6 10

Table 2.0 Conditions for Test Series 2
RATED LOAD, INCREASING SPEED, NO ORIFICES 11
Table 2.1 Results of Tests 2A to 2G 12

Table 3.0 Conditions for Test Series 3
RATED LOAD, INCREASING SPEED, ORIFICES 14
Table 3.1 Results of Tests 3A to 3G 15

Table 4.0 Conditions for Test Series 4
RATED LOAD, INCREASING SPEED, COLD AND WARM SEA WATER 17
Table 4.1 Results of Tests 4AA to 4AG 18
Table 4.2 Results of Tests 4BA to 4BF 20

Table 5.0 Conditions for Test Series 5
INCREASING OVERLOAD, NO ORIFICES, SHAFT STOPPED 22
Table 5.1 Results of Tests 5A to 5G 23

Table 6.0 Conditions for Test Series 6
OVERLOAD, ORIFICES, SEA WATER, SHAFT STOPPED 25
Table 6.1 Results of Tests 6A to 6K 26

Table 7.0 Conditions for Test Series 7
INCREASING OVERLOAD. ORIFICES, CONSTANT SPEED 29
Table 7.1 Results of Tests 7A to 7F 30

Table 8.0 Conditions for Test Series 8
INCREASING OVERLOAD, SHAFT STOPPED, PACO PUMP 32
Table 8.1 Results of Tests 8AA to 8AM 33
Table 8.2 Results of Tests 8BA to 8BG 37

Table 9.0 Conditions for Test Series 9
CONSTANT OVERLOADS, INCREASING SPEEDS, PACO PUMP 39
Table 9.1 Results of Tests 9AA to 9AF 40
Table 9.2 Results of Tests 9BA to 9BG 42
Table 9.3 Results of Tests 9CA to 9CF 44

Table 10.0 Conditions for Test Series 10 OVERLOADS, MODIFIED BOTTOM HALF BEARING. 46
Table 10.1 Results of Tests 10AA to 10AG 47
Table 10.2 Results of Tests 10BA to 10BG 49
Table 10.3 Results of Tests 10CA to 10CD 51

Table 11.0 Conditions for Test Series 11 RATED VERTICAL LOAD, INCREASING LATERAL LOAD, SHAFT STOPPED 52
Table 11.1 Results of Tests 11A to 11F 53

Table 12.0 Conditions for Test Series 12 RATED VERTICAL LOAD, INCREASING LATERAL LOAD, CONSTANT RPM 55
Table 12.1 Results of Tests 12A to 12G 56

Table 13.0 Conditions for Test Series 13 RATED VERTICAL LOAD, IMPULSIVE LATERAL LOAD, CONSTANT RPM 58
Table 13.1 Results of Tests 13A-90 to 13A-90E 59
Table 13.2 Results of Tests 13B-90B to 13B-90G 61
Table 13.3 Results of Tests 13C-90B to 13C-90G 63
Table 13.4 Results of Tests 13D-90B to 13D-90G 65

Table 14.0 Conditions for Test Series 14 INCREASING VERTICAL OVERLOAD, SHAFT STOPPED 67
Table 14.1 Results of Tests 14-101A to 14-101D 68

Table 15.0 Conditions for Test Series 15 INCREASING VERTICAL OVERLOAD. DECREASING RPM 69
Table 15.1 Results of Tests 15-107A to 15-107D 70

Table 16.0 Conditions for Test Series 16 CONSTANT IMPULSIVE VERTICAL OVERLOAD, CONSTANT RPM 71
Table 16.1 Results of Tests 16A-107A and 16A-107B 72
Table 16.2 Results of Tests 16B-107C to 16B-107F 73
Table 16.3 Results of Tests 16C-107G to 16C-107J 74

Table 17.0 Conditions for Test Series 17 IMPULSIVE VERTICAL OVERLOAD WITH AIR VESSELS 75
Table 17.1 Results of Test Sheets 120, 123, 125 and 127 76

There are no tables associated with Test Series 18

There are no tables associated with Test Series 19

Table 20.00 Conditions for Test Series 20 LOAD/FLOAT/PRESSURE/FLOW RELATIONSHIP INVESTIGATION 77
Table 20.0A DECREASING MANIFOLD PRESSURES, RATED APPLIED LOAD Results of Tests A to N 78
Table 20.0B INCREASING MANIFOLD PRESSURES, RATED APPLIED LOAD Results of Tests A to P 82
Table 20.1A DECREASING MANIFOLD PRESSURES, 1000 LB APPLIED LOAD Results of Tests A to Q 86

Table 20.1B	INCREASING MANIFOLD PRESSURES, 1000 LB APPLIED LOAD Results of Tests A to N	91
Table 20.2A	DECREASING MANIFOLD PRESSURES, 2000 LB APPLIED LOAD Results of Tests A to P	95
Table 20.2B	INCREASING MANIFOLD PRESSURES, 2000 LB APPLIED LOAD Results of Tests A to S	99
Table 20.3A	DECREASING MANIFOLD PRESSURES, 3000 LB APPLIED LOAD Results of Tests A to O	104
Table 20.3B	INCREASING MANIFOLD PRESSURES, 3000 LB APPLIED LOAD Results of Tests A to T	108
Table 20.4A	DECREASING MANIFOLD PRESSURES, 4000 LB APPLIED LOAD Results of Tests A to Q	113
Table 20.4B	INCREASING MANIFOLD PRESSURES, 4000 LB APPLIED LOAD Results of Tests A to S	118
Table 20.5A	DECREASING MANIFOLD PRESSURES, 5000 LB APPLIED LOAD Results of Tests A to N	123
Table 20.5B	INCREASING MANIFOLD PRESSURES, 5000 LB APPLIED LOAD Results of Tests A to O	127
Table 20.6A	DECREASING MANIFOLD PRESSURES, 6000 LB APPLIED LOAD Results of Tests A to N	131
Table 20.6B	INCREASING MANIFOLD PRESSURES, 6000 LB APPLIED LOAD Results of Tests A to M	135
Table 20.7A	DECREASING MANIFOLD PRESSURES, 7000 LB APPLIED LOAD Results of Tests A to P	139
Table 20.7B	INCREASING MANIFOLD PRESSURES, 7000 LB APPLIED LOAD Results of Tests A to Q	143
Table 20.8A	DECREASING MANIFOLD PRESSURES, 8000 LB APPLIED LOAD Results of Tests A to R	148
Table 20.8B	INCREASING MANIFOLD PRESSURES, 8000 LB APPLIED LOAD Results of Tests A to R	153
Table 20.9A	DECREASING MANIFOLD PRESSURES, 9000 LB APPLIED LOAD Results of Tests A to S	158
Table 20.9B	INCREASING MANIFOLD PRESSURES, 9000 LB APPLIED LOAD Results of Tests A to R	163

1.0 INTRODUCTION

1.1 General

This report provides the results of a test project on a 6 1/2 inch (165.1 mm) diameter model hydrostatic bearing undertaken at the Naval Engineering Test Establishment under Contract DSS File 15MJ.T 8200-1-1503 dated 16th December, 1981 with Peacock Incorporated. The bearing was designed by R.H.F. Dillon of the Transportation Development Centre, Transport Canada.

The model bearing and its testing were conceived to simulate the hydraulic pressures, peripheral shaft velocities and shaft and bearing clearance conditions of a ship's stern tube bearing. The full scale bearing, a design which was patented by R.H.F. Dillon (U.S. Patent 4,005,916 of February 1st, 1977), is intended for ships up to the size of large resource carriers.

1.2 Design Objectives

These are stated in the Patent as follows:

"1. The bearing should not be subject to wear, or at least, the wear should be minimal.

2. Lubrication, and hence security of the bearing, should be stable down to at least one r.p.m. and preferably at all speeds since very excessive wear can be expected to result on plummer blocks and stern tubes by the very slow revolutions given to the shaft (several minutes per revolution) during warming up and cooling down processes when there is no possibility of a hydrodynamic film being established on the surface of the conventional bearings.

3. The bearing should be self-aligning to allow for variations in shaft alignment both initially and due to loading, pitching and yawing movements during operation of the vessel. This alteration in alignment can have disastrous effects on a fixed bearing.

4. The bearing should not be subject to whirl and radial run-out of the shaft should be an absolute minimum to ensure stability and long life to any seal fitted to the shaft.

5. The friction should be minimal.

6. The bearing should be designed for a rubbing speed of about 1000 feet per minute which appears compatible with the 15 inch shaft of a destroyer type vessel which rotates at approximately 250 r.p.m. or the three feet diameter shaft of supertankers rotating at appoximately 100 r.p.m."

The designer considers that these requirements could be better assured by a bearing operating under hydrostatic conditions than by one relying on hydrodynamic principles. If water is supplied, under pressure, to recesses within the bearing, the shaft can be lifted free of contact with it. It is then free to rotate. Incorporation of a self-alignment feature into the design would permit alignment of the shaft in relation to the bearing and counter the effect of hull structure deflections. Partial bearings suppress whirling and the vibrations caused by it. Hydrostatic bearings generate very little friction.

1.3 Layout of the Report

The report is in two volumes. Volume I contains the text and appendices and Volume II contains the tables of test results.

The text is divided into nine sections. Following this introductory Section 1, Sections 2 and 3 give descriptions of the model test bearing and the test rig respectively.

Twenty series of tests were conducted and their results are presented in Section 5.1 to 5.20. Each subsection number corresponds to the test series number. Each series was intended to investigate a particular aspect of the bearing's performance. Each aspect was, as a rule, examined first with the shaft at rest and then with the shaft rotating. Within each test series the test conditions remained, in general, fixed; the conditions are listed in the first table (Tables 1.0, 2.0, 3.0 etc.) of the set of tables for each tests series.

Test conditions were changed as necessary to meet the needs of the tests. Sometimes, however, changes were imposed by external factors. Since a clear idea of the conditions pertaining at any one time is essential in evaluating the results, the conditions are summarised in Section 4. For easy reference the various changes are listed in Table 0.1 at the end of that section. The findings of inspections of the bearing are given in Section 6. The results of the tests are discussed and analysed in Section 7.

The appendices contain supporting material, in particular drawings, sketches and photographs of the bearing and test rig.

1.4 Terminology - Definitions

1.4.1 Shaft/Bearing Displacement

Two terms are employed to describe the position of the shaft with respect to the bearing. These are "Float" and "Displacement". They are defined as:

- Float: The rise of the shaft from metallic contact with the bottom half, i.e. bottom radial clearance.

- Displacement: The separation of the shaft and bearing axes measured downwards for conditions of vertical load and horizontally for conditions of lateral load.

The sum of float and vertical displacement is always 0.0020 inches.

1.4.2 Total and Applied Loads

The figures listed in the tables of test results under the heading TOTAL LOAD are the loads actually carried by the lower half of the bearing. The TOTAL load includes components due to:

1) the weight of the shaft;

2) the load applied by the loading mechanism;

3) the vertical component of thrust of the four pistons.

The figures under APPLIED LOAD in the tables contain the first two components only. The externally applied load represents the useful load-carrying capacity of the model bearing.

1.4.3 Rated Load and Overload

The rated load is 5275 lb, this being the nominal value of the TOTAL LOAD as defined above. A rated piston pressure of 145 psig is assumed. Overload is expressed in terms of percentage of TOTAL LOAD. As this includes piston load, overload does not, in this case, refer to the excess of load above the load-carrying capacity of the bearing.

1.4.4 Rated Speed

This is 553 rpm, equivalent to a surface speed of 940 ft/min in a supertanker stern tube bearing.

1.4.5 Coefficient of Friction

This is defined as:

$$\frac{\text{Torque (inch.lb)}}{\text{Total Load (lb)} \times \text{Journal Radius (in)}}$$

2.0 TEST BEARING AND SHAFT

2.1 General Description

The 6 1/2 inch diameter test bearing that was designed, manufactured and tested is a 1/5 scale model to simulate a supertanker stern tube bearing. Essentially, it embodies the requirements listed in 1.2. Such a shipboard bearing, with the small length/diameter ratio of 1.15/1, would be less susceptible to misalignment than those with ratios up to 4/1 and 2/1; these being the minimum ratios permitted by Classification Society rules for water and oil-lubricated stern tube bearings respectively.

General arrangement and manufacturing drawings of the test bearing and shaft are provided in Appendix D.

The bearing consists of top and bottom halves, machined from bronze castings and bolted together on a dowelled face-to-face horizontal joint. The lower half is a partial bearing of 160 degrees arc in which are cast two circumferential rows of five shallow flat-bottomed recesses. At rest the shaft lays in the bottom half bearing. When water under pressure is supplied to the recesses, the shaft is lifted free of metallic contact to its running position. Vertical rise of the shaft is limited by two pairs of pads located in the top half bearing, each pad being machined to the same curvature as the lower partial bearing. Two shallow flat-bottomed recesses are machined in each pad and these also are supplied with water under pressure. Each pad incorporates a piston that moves in a cylinder bored within the top half bearing. The four cylinders are bored radially at an angle of 45 degrees to the vertical and the top half bearing is symmetrical about the vertical plane through the axis. The pistons are loaded with water pressure through connections on the cylinder heads. Check valves are provided in the supplies. Each head also contains an air bleed valve and a connection for a small cushioning air vessel. In the shaft's concentric running position there is a radial clearance of 0.0020 inches.

A thread is tapped in the supply aperture to each recess, both top and bottom, to receive a flow metering orifice.

2.2 Shaft and Bearing Materials

Components in bronze were to ASTM Spec. B584-79 A11 C 86300, stress relieved, suitable for standard or precision machining as appropriate. The shaft was in steel to AISI Spec. C 4140, stress relieved. The journal surface was metallised using the METCO 442 powder spray coating method for corrosion protection before finish machining. Inspection confirmed the radial clearance between journal and bearing to be 0.0020 inches. The journal and bearing surfaces were finished to a quality of 8 and 12 r.m.s. respectively (4 and 8 ASA).

2.3 Modification to Lower Bearing

Following Test Series 9 the lower half bearing was modified. This consisted in sealing off, with epoxy ceramic, each end of the central escape annulus in the lower half bearing. The location of these sealing barriers is shown by the arrows in Photo NE 74/84, Appendix H. They were machined to a smooth contour in continuation of the cylindrical surface of the bearing.

After implementation of this modification water flow from the recesses toward the centre of the bearing was restricted. The effect of this modification was to reduce the length of the water escape gap thereby reducing the flow rate and providing an enlarged load support area.

2.4 Test Conditions and Real Operating Conditions

In two major aspects the test bearing does not simulate the running conditions of a shipboard stern tube bearing.

2.4.1 Water Escape Conditions

Whereas a stern tube bearing operates against a back pressure due to the static head of water above it, the model bearing in the rig is surrounded by air at atmospheric pressure. Issuing from the escape gap the water drains by gravity to a collecting tank.

2.4.2. Alignment of Bearing with Shaft

The patented hydrostatic bearing would be spherically mounted to take up axial shaft misalignment in all directions. In the test rig, the bearing was mounted in trunnions. These allow it to pivot and align itself with the shaft in the vertical plane through the shaft axis. The trunnions also permit sufficient freedom of lateral movement for the bearing to align itself laterally with the shaft. This freedom of movement was eliminated by a bracket bolted to the table at each side during lateral load tests.

3.0 TEST RIG

3.1 General

The installation of the shaft and bearing in the test rig is shown in Drawing D-1356 of Appendix D. Photographs of the rig are provided in Appendix H.

The bearing, shaft, loading mechanism and electric drive motor were all mounted on a base frame that was set up on a cast steel table. The bearing was mounted in trunnions that allowed it to pivot in the vertical plane and permitted a small degree of lateral movement. There was thus a measure of freedom for the bearing to align itself with the shaft.

The shaft was driven by a variable-speed DC motor and was supported, at its driven end, by a self-aligning roller bearing. The very small torque necessary to spin the journal was transmitted through toothed sheaves. The toothed driving belt was mounted slack to reduce, to a minimum, the lateral force imposed on the journal.

3.2 Loading mechanism

This is illustrated in Figures 1, 2, 3 and 4 of Appendix E and on NETE Drawings D-1356 and D-1358 of Appendix D. The sketches show the principles of application of the three modes of loading: vertical; lateral and impulsive.

Test loads were applied at the shaft's free end through a triple lever mechanism using a roller bearing. The overall mechanical advantage of the loading mechanism was 18:1. The shaft itself was a second order lever, providing a further mechanical advantage of 1 1/3:1 between the test bearing and the load-applying roller bearing. The overall mechanical advantage was thus 24:1. The weights of shaft and linkage represented 915 lb at the bearing centreline.

3.2.1. Calculation of Total, Rated and Applied Load

The TOTAL load is calculated using the expression:

$$L = 226 + 689 + (P \times 6.324) + (W \times 24) \text{ lb}$$

where	L	is the total load
	P	is the pressure on the pistons in psig.
	W	is the load applied to the mechanism in lb.
	226	is the load on the bearing due to the weight of the shaft.
	689	is the load on the bearing due to the weight of the loading arms.
	6.324	represents the area and number of the pistons and compensates for the obliquity of action of their thrusts.
	24	is the mechanical advantage of the loading mechanism.

With the rated piston pressure of 145 psig the RATED load of 5275 lb is reached when the load applied to the mechanism is 143.46 lb:

$$L = 226 + 689 + (145 \times 6.324) + (143.46 \times 24) \text{ lb}$$

$$L = 5275 \text{ lb}$$

The APPLIED Load, indicated in the tables, is the Total Load less the load due to the pistons.

3.2.2. Application of Impulsive Loads

Impulsive loads within the range of 0 to 8 Hz were applied to the shaft through the loading mechanism by an impulse generator. This consisted of electrical, pneumatic and mechanical components operating in association with a single exhaust solenoid valve which admitted and released compressed air to and from a ram. Under impulsive loading a spring capable of fine adjustment for control of the applied load was employed. Having less inertia than the weights the spring enabled the full value of the applied load to be maintained at the higher frequencies. Apart from this consideration the spring was also desirable in view of the labour involved in man-handling weights up to 42 pounds to and from the scale pan. The spring applied its load through an overall mechanical advantage of 4:1.

3.3 Calculation of Coefficient of Friction

This is defined as:

$$\frac{\text{Torque (inch.lb)}}{\text{Total Load (lb)} \times \text{Journal Radius (in)}}$$

in which expression the torque and HP of the DC motor were established as follows:

$$\text{HP} = \frac{\text{volts} \times \text{amps}}{746}$$

and

$$\text{Torque} = \frac{\text{HP} \times 33000 \times 12}{\text{rpm} \times 2 \times 3.1416} \; \frac{\text{rev}}{\text{rad}} \; \frac{\text{ft lbf}}{\text{HP min}} \; \frac{\text{in}}{\text{ft}}$$

$$\text{Torque} = \frac{\text{HP} \times 63025}{\text{rpm}} \quad \text{in lbf}$$

3.4 Test Rig Water System

This is shown on NETE Dwg. C-1285, in Appendix D.

Fresh or sea water, filtered and cooled, was delivered to the bearing by a supply pump. Two pumps were used in the course of the tests: a KOBE [Model No. RGB 150] and a PACO [Model No. 162D BF]. The characteristic curves of these pumps are shown in Appendix A.

Pump discharge pressure was controlled by a by-pass incorporating a manual and a back pressure regulating valve.

Water entered the bearing through three manifolds, these supplying the top half recesses, the bottom half recesses and the piston cylinders. The supply pressure setting could be adjusted manually to accommodate various test conditions. From Test Series 8 onwards, pressure in the header supplying the top half recesses was maintained at about one third of the pump discharge pressure by a reducing valve. The circulating water was maintained at ambient temperature by a cooler. The pressure and velocity energy generated by the pump was dissipated in the bearing and the system circuitry. The cooler was oversized for its duty, as also was the KOBE pump. A 10 micron filter was installed at the pump inlet.

Having passed through the bearing, the water drained to a collecting tank. From this it was lifted to the supply tank by an auxiliary pump. A constant level was maintained in the supply tank by a make-up connection and an overflow back to the collecting tank.

3.5 Instrumentation

Instrumentation was incorporated in the bearing and the test rig for the recording of flows, pressures, water temperatures, shaft rpm, displacement of the shaft axis from the bearing axis and its vibration under cyclic loading. From Test Series 12 onwards most of the readings were recorded by a data logger. Details of the logger channels and measuring points will be found in Appendix F.

3.5.1. Flows

Flows were recorded:

- to each of the eight individual recesses in the top half in Test Series 2 to 10. Before Test Series 11 the connections were changed to record the flows to each of the four pairs of recesses. The data logger, which was connected to the measuring sensors after Test Series 12, did not possess enough channels to record all the flows that, until then, had been recorded visually.

- to each of the five fore/aft pairs of recesses in the bottom half;
- to the top half recesses collectively (Gemst);
- to the bottom half recesses collectively (Gemst);
- to the four pistons collectively (to check for leaks)

3.5.2. Pressures

Pressure was recorded by means of tappings into:

- the two forward outer recesses and the forward centre recess in the bottom half;
- each of the eight individual recesses in the top half in Test Series 2 to 10 and to one recess of each of the four pairs of recesses from Test Series 11 onwards. The data logger, which was connected to the measuring sensors from Test Series 13 onwards, did not possess enough channels to record all the pressures that, until then, had been recorded visually.
- the manifold to which the cylinders were connected.

3.5.3. Temperatures

Water temperatures were measured in the:

- manifold supplying the bottom half bearing recesses.
- drain from the bearing to the collector tank.

3.5.4. Shaft Speed

This was read by a magnetic speed sensor.

3.5.5. Shaft Displacement

At rest, the vertical displacement of the shaft was measured by two precision dial gauges located on either side of the bearing 4 1/2 inches from its centre. Since clock gauges are subject to wear against moving surfaces proximity probes were substituted after Test Series 12.

From Test Series 13 to 18 displacements were measured by proximity probes in the vertical and horizontal planes as appropriate. Vertical and horizontal displacements from the proximity probes were linked to an oscilloscope which traced the movement of the shaft axis. At zero displacement (shaft and bearing axes coincident) the trace was set at the centre of the grid on the oscilloscope scan. The edge of the grid then represented absorption of radial clearance at a displacement of 0.0020 in. See Appendix B.

Initially these probes were located within the water outlet space of the bearing but, for the sake of a clearer signal, two were later relocated outside. In Appendix B the notations "wet" and "dry" indicate that the probe is located either inside or outside the water space.

3.5.6. Shaft Vibration

The r.m.s. value of shaft vibration were measured, in Test Series 13 to 16, by sensors mounted on the outer race of the load-applying ball bearing.

3.6 Accuracy of the Instrumentation

The accuracy of the instrumentation listed in Appendix G is detailed in the following list:

INSTRUMENTATION AND RANGE	ACCURACY
1) Data instruments model EA0200/AG pressure transducer, range 0 to 200 psig	± 0.5% of span
2) DeLaval model FT 200, P/N 58712 flow transducer, range 0.5 to 5 USGPM	± 1.5% of span
3) DeLaval model FT 200, P/N 58713 flow transducer, range 1 to 10 USGPM	± 1.5% of span
4) DeLaval model FT 200, P/N 58711 flow transducer, range 0.2 to 2 USGPM	± 1.5% of span
5) DeLaval model FT 200 P/N 60426 flow transducer, range 3.5 to 35 USGPM	± 1.5% of span
6) Thermoelectric model T18G304 "J" type thermocouples, range 30 to 530 deg.F	± 1 deg.F
7) Electro Products model 3010 magnetic speed sensor, range 0 to 2000 rpm	± 1 rpm
8) Cox model AN 24 turbine flowmeter, range 12.5 to 125 USGPM	± 0.25% of scale
9) Bently Nevada model 21500-04-30-10-02 displacement probes, range 10 to 80 thousandths of an inch	± 4% of difference between reading and lower end of range.
10) Bruel and Kjaer type 4371 vibration sensors, range 2 to 12650 Hz	± 2% of reading
11) Ashcroft 6 in dia. pressure gauges, range 0 to 300 psig	± 1% of scale
12) All Star 6 in dia. pressure gauges, range 0 to 200 psig	± 1% of scale
13) Taylor mercury thermometer, range 40 to 170 deg.F	± 1% of reading

INSTRUMENTATION AND RANGE	ACCURACY
14) Loading mechanism weights, range 140 to 300 lb with 24:1 mechanical advantage.	± 1 lb
Calculated bearing load, range 5275 to 10000 lb	± 0.35% of reading
15) Loading mechanism loading spring, range 800 to 1100 lb with 4:1 mechanical advantage.	± 4.43 lb
Calculated bearing load, range 5000 to 6000 lb	± 0.35% of reading
16) Loading mechanism pneumatic ram, range 0 to 200 lb with 24:1 mechanical advantage	± 2 lb
Calculated bearing load, range 5275 to 10000 lb	± 0.7% of reading

4.0 TEST CONDITIONS

4.1 Intentions of the Test Programme

Twenty series of tests were conducted in all. Their results are contained in the tables of Volume II and an analysis is provided in Section 5. The table numbers and subsection numbers correspond to the test series number.

The aim of Test Series 1 was to establish the water pressure required in the lower recesses to lift the stationary shaft to the design radial running clearance of 0.0020 inches at load increments up to the rated load of 5275 lb. For this series of tests the pistons were removed, leaving the journal without any restraint from the top half of the bearing.

The bearing was reassembled for Test Series 2 in which the rated load was applied to the shaft rotating at speeds up to full speed. Following this test series orifices were fitted in the supply channels to each of the eighteen recesses. The bottom orifices (0.1350 in dia.) were sized to assist in equalising the flows to each recess and the top orifices (0.0718 in dia.) were sized to reduce the pressure in the recesses.

In Test Series 3 the conditions of Test Series 2 were repeated with the orifices in place. The pressure drop across them accounts for the differences between manifold and recess pressures recorded in later tests.

In Test Series 4 the tests were repeated at rated load and speeds up to full speed using artificial sea water as the medium. Two runs were conducted: in the first the sea water was chilled (8 to 15 deg.C); in the second it was at ambient temperature.

In Test Series 5 the bottom orifices were removed and the stationary shaft was subjected to overload. The orifices were replaced for Test Series 6 in which overload was applied using sea water as the medium. In Test Series 7 overload was applied with the shaft rotating.

In Test Series 8 and 9 higher overloads were applied to the stationary and rotating shaft using higher pressure water from a different supply pump. This, the Paco pump, was retained for all succeeding tests.

From Test Series 10 onwards the bottom half of the bearing was modified to provide a greater load-carrying area (See Section 2.3) and the bearing was tested at the rated load and overloads at increasing speeds.

Lateral loads were applied to the stationary and rotating shaft in Test Series 11 and 12.

From Test Series 13 onwards readings were taken by a data logger capable of recording 34 channels in 14 seconds. The logger was introduced because a full ten minutes were required for the visual recording of readings.

In Test Series 13 impulsive lateral loads were applied at frequencies from 1 to 4 Hz, simulating the conditions of loading experienced by sterntube bearings under the hydrodynamic interaction of propeller blades and hull.

In Test Series 14 steady vertical overloads up to 56.4% above the rated were applied to the stationary shaft. In Test Series 15 even higher vertical overloads were applied to the rotating shaft.

In Test Series 16 vertical impulsive overloads were applied at several different frequencies to the running shaft. An air cushioning vessel was then installed in the cylinder head of each piston and, in Test Series 17, nearly 100% impulsive overload was then applied at frequencies from 1 to 5 Hz whilst particular attention was paid to measurements of shaft displacement.

For Test Series 17 air vessels of different volumes were fitted to the piston cylinders and shaft displacements were measured under increasing impulsive overload at frequencies from 1 up to 8 Hz.

Test Series 18 regroups the readings of two accelerometers, mounted on the outer race of the load-imposing bearing, which measured vertical, lateral and longitudinal vibrations. Recordings were taken at various speeds under conditions of steady vertical overload from Test Series 13 onwards.

Test Series 19 investigated the reaction of the bearing to axial misalignment such as stern tube bearings experience due to the bending of a ship's hull in a seaway. The bearing was made to tilt about its pivot support under the action of an externally applied torque.

Test Series 20 was a lengthy investigation into the hydrostatic characteristics of the bearing in which readings of lower half pressure, applied load and shaft float were recorded. Having applied enough bottom pressure to centre the shaft in the bearing, readings of decreasing float were recorded with falling values of pressure until shaft/bearing contact occurred. Increasing floats were then recorded with rising values of pressures until the bearing was once again centred. This cycling was repeated at increasing levels of applied load from 1,000 to 9,000 lb.

4.2 Conditions Imposed during Testing

In the course of testing a number of parameters were changed. Although, in general, changes were made to meet the conditions of a given test series, sometimes they were imposed by unavoidable considerations in the organisation of the work of the test establishment.

These changes, which are summarised for easy reference in Table 0.1, at the end of this section, are:

1. Orifices - Fitted or not fitted.
2. Check Valves - Installed or not installed.
3. Air Vessels - Installed or not installed.
4. Pressure Regulator (in supply to Upper Half Recesses) - Installed or not installed.
5. Pump - KOBE or PACO.
6. Shaft Rotation - Stopped, Constant or Increasing rpm.
7. Vertical Loading - Rated load or Overload; Constant or Increasing; Steady or Impulsive.
8. Lateral Loading - Constant or Increasing; Steady or Impulsive.
9. Water - Fresh or Sea water.
10. Water Temperature - Ambient or Chilled.
11. Lower Half Bearing - Unmodified or Modified for increased support area.
12. Test observations - Recorded visually or by data logger.

TABLE 0.1 TABLE 0.1

SUMMARY OF CONDITIONS IMPOSED DURING EACH SERIES OF TESTS

TABLE NUMBERS	1.1 - 1.7	2.1	3.1	4.1	4.2	5.1	6.1	7.1
TEST SERIES	1	2	3	4A	4B	5	6	7
ORIFICES?	N	N	Y	Y	Y	N	Y	Y
CHECK VALVES?	N	Y	Y	Y	Y	Y	Y	Y
AIR VESSELS?	N	N	N	N	N	N	N	N
PRESSURE REGULATOR?	N	N	N	N	N	N	N	N
KOBE OR PACO PUMP	K	K	K	K	K	K	K	K
SHAFT ROTATION	S	I	I	I	I	S	S	C
VERTICAL LOADING	I	R	R	R	R	IO	O	IO
LATERAL LOADING	N	N	N	N	N	N	N	N
WATER: FRESH/SEA	FW	FW	FW	SW	SW	FW	SW	FW
WATER: CHILLED/AMBIENT	AM	AM	AM	CH	AM	AM	AM	AM
BOTTOM HALF MODIFIED?	N	N	N	N	N	N	N	N
DATA LOGGER CONNECTED?	N	N	N	N	N	N	N	N

TABLE NUMBERS	8.1	8.2	9.1	9.2	9.3	10.1	10.2	10.3	11.1
TEST SERIES	8A	8B	9A	9B	9C	10A	10B	10C	11
ORIFICES?	Y	Y	Y	Y	Y	Y	Y	Y	Y
CHECK VALVES?	Y	Y	Y	Y	Y	Y	Y	Y	Y
AIR VESSELS?	N	N	N	N	N	N	N	N	N
PRESSURE REGULATOR?	Y	Y	Y	Y	Y	Y	Y	Y	Y
KOBE OR PACO PUMP	P	P	P	P	P	P	P	P	P
SHAFT ROTATION	S	S	I	I	I	I	I	S	S
VERTICAL LOADING	IO	IO	R	CO	CO	R	CO	IO	R
LATERAL LOADING	N	N	N	N	N	N	N	N	I
WATER: FRESH/SEA	FW	FW	FW	FW	FW	FW	FW	FW	FW
WATER: CHILLED/AMBIENT	AM	AM	AM	AM	AM	AM	AM	AM	AM
BOTTOM HALF MODIFIED?	N	N	N	N	N	Y	Y	Y	Y
DATA LOGGER CONNECTED?	N	N	N	N	N	N	N	N	N

Y	YES	N	NO	S	STOPPED
R	RATED	C	CONSTANT	I	INCREASING
O	OVERLOAD	V	IMPULSIVE	AM	AMBIENT
FW	FRESH WATER	SW	SEA WATER	CH	CHILLED
K	KOBE PUMP	P	PACO PUMP	*	VARIOUS

TABLE 0.1 CONTINUED TABLE 0.1

SUMMARY OF CONDITIONS IMPOSED
DURING EACH SERIES OF TESTS

TABLE NUMBERS	12.1	13.1	13.2	13.3	13.4	14.1	15.1
TEST SERIES	12	13A	13B	13C	13D	14	15
ORIFICES?	Y	Y	Y	Y	Y	Y	Y
CHECK VALVES?	Y	Y	Y	Y	Y	Y	Y
AIR VESSELS?	N	N	N	N	N	N	N
PRESSURE REGULATOR?	Y	Y	Y	Y	Y	Y	Y
KOBE OR PACO PUMP	P	P	P	P	P	P	P
SHAFT ROTATION	C	C	C	C	C	S	Y
VERTICAL LOADING	R	R	R	R	R	IO	IO
LATERAL LOADING	I	I	V	V	V	N	N
WATER: FRESH/SEA	FW	FW	FW	FW	FW	FW	FW
WATER: CHILLED/AMBIENT	AM	AM	AM	AM	AM	AM	AM
BOTTOM HALF MODIFIED?	Y	Y	Y	Y	Y	Y	Y
DATA LOGGER CONNECTED?	N	Y	Y	Y	Y	Y	Y

TABLE NUMBERS	16.1	16.2	16.3	17.1	None	None	20.*
TEST SERIES	16A	16B	16C	17	18	19	20
ORIFICES?	Y	Y	Y	Y	Y	Y	Y
CHECK VALVES?	Y	Y	Y	Y	Y	Y	Y
AIR VESSELS?	N	N	N	Y	N	N	N
PRESSURE REGULATOR?	Y	Y	Y	Y	Y	Y	Y
KOBE OR PACO PUMP	P	P	P	P	P	P	P
SHAFT ROTATION	Y	C	C	S	*	S	S
VERTICAL LOADING	R	VO	VO	VO	*	R	*
LATERAL LOADING	N	N	N	N	*	N	N
WATER: FRESH/SEA	FW	FW	FW	FW	FW	FW	FW
WATER: CHILLED/AMBIENT	AM	AM	AM	AM	AM	AM	AM
BOTTOM HALF MODIFIED?	Y	Y	Y	Y	Y	Y	Y
DATA LOGGER CONNECTED?	Y	Y	Y	Y	Y	Y	Y

Y	YES	N	NO	S	STOPPED
R	RATED	C	CONSTANT	I	INCREASING
O	OVERLOAD	V	IMPULSIVE	AM	AMBIENT
FW	FRESH WATER	SW	SEA WATER	CH	CHILLED
K	KOBE PUMP	P	PACO PUMP	*	VARIOUS

5.0 TEST PROCEDURES AND RESULTS

5.1 Test Series 1 - Preliminary Tests
Pistons Removed from Top Half

On completion of manufacture of the test rig and the installation and instrumentation of the model bearing a preliminary series of tests was conducted. For this series the pistons were removed from their cylinders leaving the journal without any restraint from the top half of the bearing.

5.1.1 Test Series 1 - Objectives

These tests were conducted to:

(a) examine the stability of the shaft when "floated" up by supplying water under pressure to the bottom recesses at bottom clearances up to 0.0035 inches;

(b) ensure that the rated load of 5275 lb could be supported at a clearance of 0.002 inches and to

(c) establish presure/flow relationships for different loads and floats.

In order to provide a basis of comparison for the results of this test series (for which the pistons and upper pads were removed) with the results of later tests the TOTAL load in Tables 1.1 to 1.7 is divided into two components termed "PISTON" load and "APPLIED" load. This equivalent fictional "PISTON" load is based on the bottom manifold pressure and is calculated with the expression in Section 3.2.1.

5.1.2 Test Series 1 - Results

The results are given in Tables 1.0 to 1.7. Tables 1.1 to 1.6 present the readings of tests in which successive increments of load were applied up to the rated load of 5275 lbs. In Table 1.7 data from the test results are regrouped under increments of shaft float.

5.1.3. Test Series 1 - Discussion of Results

For each successive load up to 5275 lb manifold pressures were recorded corresponding to bottom clearances up to 0.0035 inches. At the rated load and 0.0020 inches radial clearance this pressure was 163 psig and the associated flow was 20.3 igpm. Points taken from the data of Table 1.7 are plotted on the graph of Figure 1. The operating point shown on the graph is the design point of the bearing.

The shaft could be rotated freely by hand under every load.

A quantity termed "average discharge velocity" was calculated (see note at the foot of the tables) to represent the average velocity of water escaping from the clearance gap. The method of calculation is only strictly valid for a parallel gap and thus only for a float of 0.0020 inches. At other clearances the width of the gap will vary and hence the velocities of the escaping water will vary at different points along the horizontal and annular parts of the slot.

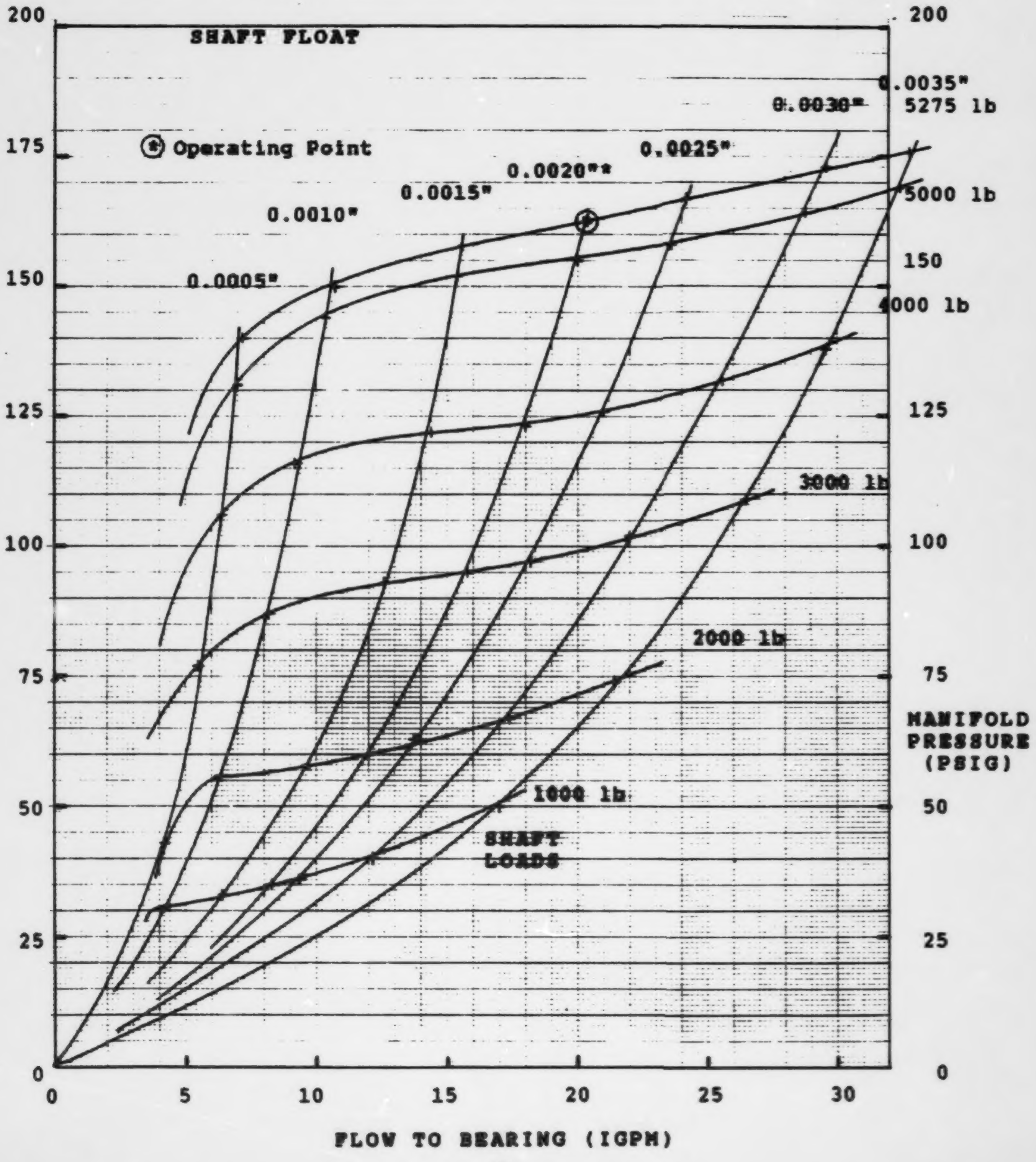
Figure 1 displays the overall hydraulic characteristics of the bearing under the conditions of Test 1 in which the shoes in the top half were removed. It demonstrates that it is capable of carrying its rated load whilst maintaining its design clearance. The plotted data points lie, in general, close to the families of curves drawn through them, indicating that the characteristics of such a bearing will be of a regular and predictable nature. These preliminary tests thus opened the way to further tests in which a more searching analysis of individual recess pressures and flows under various conditions of speed and loading was conducted.

Without the clamping effect of the pistons and pads,

FIGURE 1. TEST SERIES 1. PRELIMINARY TESTS WITH PISTONS REMOVED FROM TOP HALF BEARING.

SHAFT LOAD AND FLOAT FOR DIFFERENT MANIFOLD PRESSURE/FLOW CONDITIONS.

The shaft float figures are the averages of measurements taken at each end of the bearing.



the lower half of the bearing tended to move out of axial alignment with the shaft as it was lifted clear of metallic contact. The shaft float figures given in these curves are the averages of the bottom clearances measured at the ends of the bearing.

5.2 Test Series 2
Rated Load, Increasing Speed, No Orifices

On completion of the preliminary tests the bearing was fully assembled and instrumented for Test Series 2. This was a series of seven tests under steady rated vertical load at increasing shaft speeds.

5.2.1 Test Series 2 - Objectives

To investigate the ability of the bearing to carry its steady rated vertical load of 5275 lb and to decide on the sizes of orifices to be screwed into the recess supply channels for the next test series.

5.2.2 Test Series 2 - Results

Results are given in Tables 2.0 and 2.1. On admitting water under pressure to the assembled bearing the shaft was lifted to concentricity and was free to rotate. In each test the water pressure was adjusted to maintain a bottom radial clearance of 0.002 in. The clearances of the top half pads, measured by feeler gauge, were also found to be 0.002 inches and the flows and pressures needed to provide this clearance were recorded.

With the shaft at rest (Test 2A) the flows to top and bottom halves were 8.4 and 14.2 igpm respectively. Corresponding average recess pressures were 42.7 and 152.2 psig for a bottom manifold pressure of 158.0 psig.

Tests were then conducted at increments of about 110 rpm up to the rated speed of 553 rpm. The results for this speed are shown under Test 2F.

5.2.3 Test Series 2 - Discussion of Results

It is noted that, for the same bottom manifold pressures, bottom recess flows were considerably smaller than those recorded in Test Series 1 for the same bottom radial clearances. This is explained by the fact that in Test Series 2, with the clamping effect of the pistons, the shaft was more stable than in Test Series 1. Without the pistons, the bearing tended to tilt out of alignment.

The bottom flow orifices were sized as metering devices and to provide a certain degree of orifice control, the pressure drop across them being limited by the relatively small available pressure from the pump. With a diameter of 0.1350 inches they provided a pressure drop of about 20 psi at a flow, per orifice, of about 1.5 igpm (See Table 3.1).

Having established that the top pad clearance required a recess pressure of about 43 psig the top orifice diameter was sized at 0.718 inches to reduce the pressure from 171 to 46 psig at a flow of about 1 igpm per orifice (Table 3.1).

These orifices were retained for all subsequent tests except those of Test Series 5.

5.3 Test Series 3
Rated Load, Increasing Speed, Orifices

With flow control orifices in the supply channels to the recesses a series of tests was conducted with load and speed conditions similar to those of Test Series 2.

5.3.1 Test Series 3 - Objectives

To investigate the performance of the bearing under the rated load with flow control orifices in the supply channels to the recesses.

5.3.2. Test Series 3 - Results

The results are given in Tables 3.0 and 3.1. At full speed (Test 3F) the flows and average recess pressures recorded were, compared with those of Series 2 without orifices (Test 2F):

TEST	Orifices	Total Load		Top Recesses		Bottom Recesses		Bottom Manifold	Disp. of Shaft Axis
		lb	%	igpm	psig	igpm	psig	psig	in
2F	Without	5449	103.3	7.6	42.7	14.2	153.4	157.6	0.0000
3F	With	5512	104.5	8.46	46.8	14.38	152.2	171.7	0.0000

5.3.3 Test Series 3 - Discussion of Results

Whereas, in the Series 2 tests, the pressure in the top recesses had to be adjusted to the desired value manually, in the Series 3 tests pressure reduction was provided by the orifices.

		TEST 2F WITHOUT ORIFICES		TEST 3F WITH ORIFICES	
TOP HALF BEARING		igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER	0.85	43.5	1.00	45.5
	PORT INNER	0.80	43.1	0.96	48.3
	STBD INNER	0.47	40.3	1.02	46.9
	STBD OUTER	0.70	40.0	0.98	47.5
AFTER RECESSES	PORT OUTER	0.80	46.7	0.92	45.7
	PORT INNER	1.20	43.0	1.02	48.0
	STBD INNER	0.88	40.7	0.85	45.9
	STBD OUTER	1.28	44.2	1.28	47.4
Summed Flow, Av.Press.		6.98	42.7	8.08	46.8
FLOW BY GEMST		7.6		8.46	
MANIFOLD PRESSURE			46.0		170.0
PISTON PRESSURE			156.1		166.0
BOTTOM HALF BEARING		igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	1.25	153.0	2.02	145.1
	PORT INNER	2.85		2.36	
	CENTRE	1.60	154.6	2.13	156.5
	STBD INNER	0.95		2.66	
	STBD OUTER	3.85	152.3	3.85	155.0
Summed Flow, Av.Press.		10.50	153.4	13.22	152.2
FLOW BY GEMST		14.2		14.38	
MANIFOLD PRESSURE			157.6		171.7

The effect of the bottom orifices is quite evident from the tabulated figures for these two tests. A better distribution of flow to the lower recesses is obtained.

5.4 Test Series 4 - Rated Load, Increasing Speed, Cold and Warm Sea Water

Tests of steady rated vertical load at increasing speeds were then conducted with artificial sea water, first at cold and then at ambient temperatures.

5.4.1 Test Series 4 - Objectives

To compare the performance of the bearing running on sea water with its performance using fresh water in the previous test series. Two analagous series of tests were performed, first with cold and then with warm sea water.

5.4.2 Test Series 4 - Results

The results are presented in Tables 4.0, 4.1 and 4.2. The full speed tests 4AF and 4BF gave marginally higher recess flows, pressures and friction coefficients than those of the preceding series:

TEST	Medium	Water Temp	Total Load		Top Recesses		Bottom Recesses		Bottom Manifold
		C	lb	%	igpm	psig	igpm	psig	psig
3F	Fresh	23.9	5512	104.5	8.46	46.8	14.38	152.2	171.7
4AF	Sea	8.3	5571	105.6	8.88	50.5	15.41	159.3	173.6
4BF	Sea	22.2	5569	105.6	8.74	50.6	15.62	151.7	178.0

5.4.3 Test Series 4 - Discussion of Results

The marginally higher pressure values recorded with sea water as compared with fresh water are due, in part, to the slightly higher loads imposed in 4AF and 4BF with sea water. No effects due to viscosity or density differences were apparent between the tests conducted in Series 3 with fresh water and these tests employing sea water.

5.5 Test Series 5 - Increasing Overload, No Orifices, Fresh Water, Shaft Stopped

5.5.1 Test Series 5 - Objectives

To investigate the ability of the bearing to support steady vertical overload.

5.5.2 Test Series 5 - Results

These are shown in Tables 5.0 and 5.1. At increments of steady vertical load above the rated load the bottom radial clearance was progressively reduced to 0.00015 ins at an overload of 28.8% (Test 5G). Pressure and flow conditions were:

TEST	Load	Over load	Top Recesses		Bottom Recesses		Bottom Manifold	Displacement of Shaft Axis
	lb	%	igpm	psig	igpm	psig	psig	in downwards
5G	6796	28.8	5.78	45.9	5.37	168.6	168.5	0.00185

5.5.3 Test Series 5 - Discussion of Results

The bearing showed itself capable of sustaining a static overload of 28.8% at a clearance of 0.00015 inches. All the orifices were removed for this test in order to compare operation without orifices with operation with them in Test Series 6.

5.6 Test Series 6 - Increasing Overload, Orifices, Sea Water, Shaft Stopped

5.6.1 Test Series 6 - Objectives

To investigate the bearing's overload capacity with orifices fitted for comparison with Test Series 5. Sea water was used for this test. Although fresh water was used for Test Series 5 it was shown, in Test Series 4, that this difference in operating media has no noticable effect on the flow/pressure relationship within the bearing.

5.6.2 Test Series 6 - Results

Results are shown in Tables 6.0 and 6.1. Contact of the shaft with the bottom half bearing was finally recorded in Test 6K under an overload of 36.6%. Extracts from the tables provide a comparison of conditions within the bearing for similar values of bottom clearance when using fresh water without orifices (5G) and sea water with orifices (6J and 6K):

TEST	Orifices	Medium	Over load	Top Recesses		Bottom Recesses		Bottom Manifold	Bottom Clearance
			%	igpm	psig	igpm	psig	psig	in
5G	Without	Fresh	28.8	5.78	45.9	5.37	168.6	168.5	0.00015
6J	With	Sea	33.8	8.88	51.8	4.33	182.2	185.4	0.00020
6K	With	Sea	36.6	8.88	51.4	3.35	181.3	184.6	0.00000

5.6.3 Test Series 6 - Discussion of Results

It should be noted that the bottom recess pressure for test 6J, with orifices, was 13.6 psi greater than for 5G, without orifices. An increase of 3.9% in load required an increase in bottom manifold pressure of 10% and an increase in bottom recess pressure of 8% to maintain approximately the same clearance. The change in fluid is not considered to be a relevant factor.

Although, as a general rule, only one parameter should be changed at a time when performing comparative tests, the change of fluid from fresh to sea water (at the same time as replacing the orifices) was a contingency imposed by other considerations in the work of the Establishment. The tanks containing the artificial sea water were required for other purposes. The decision was made to use it in the test rig, at this point, rather than lose the opportunity altogether.

5.7 Test Series 7

Increasing Overload, Orifices, Constant Speed

5.7.1 Test Series 7 - Objectives

Having established the static overload capacity of the bearing these tests were conducted to investigate its overload capacity at speeds up to full speed.

5.7.2 Test Series 7 - Results

As before, load was progressively increased above the rated load and readings of the downward displacement of the shaft axis were recorded. Results are given in Tables 7.0 and 7.1. In Test 7F, at an overload of 27.9%, the maximum displacement of 0.0015 inches was recorded, leaving a bottom radial clearance of 0.0005 in. Associated pressures and flows were:

TEST	Rpm	Total load	Over load	Top Recesses		Bottom Recesses		Bottom Manifold	Displacement of Shaft Axis
		lb	%	igpm	psig	igpm	psig	psig	in downwards
7F	554	6747	27.9	8.88	51.6	5.30	178.8	183.8	0.0015
6I	nil	6689	26.8	8.88	52.0	5.02	180.5	184.6	0.0015

5.7.3 Test Series 7 - Discussion of Results

The results of Test 6I, in which the same shaft displacement was recorded with the shaft at rest, are presented for comparison with those obtained at full shaft speed. The effect of shaft rotation on the overload performance of the bearing is quite clearly insignificant.

5.8 Test Series 8

Increasing Overload, Shaft Stopped, PACO Pump

5.8.1 Test Series 8 - Objectives

These tests were conducted to examine the overload performance of the bearing when supplied with water by a pump of radically different pressure/flow characteristics to the KOBE pump that was used in all previous tests. (See Appendix A for the characteristic curves of the two pumps.) A pressure regulator was fitted in the supply to the upper manifold for this test and retained for all later tests.

5.8.2 Test Series 8 - Results

The results are displayed in Tables 8.0, 8.1 and 8.2.

5.8.3. Test Series 8 - Discussion of Results

Unfortunately, it was not possible to record recess pressures during this and the next two series of tests. The transducers employed were found to have been corroded by sea water, necessitating the replacement of certain components. Testing had to proceed during their long absence for repair and recalibration by the manufacturer.

Although, with the provision of higher pressures, there was the opportunity of obtaining a stiffer bearing by replacing the bottom half orifices with others of a higher pressure drop, this test was performed with the same orifices as before for the sake of limiting the number of parameters to be changed.

TESTS 8A		8AA	8AB	8AC	8AD	8AE	8AF	8AG	8AH	8AI	8AJ	8AK	8AL
LOADS:													
APPLIED	lb	4462	4597	4735	4872	5046	5184	5373	5460	5735	5898	6048	6546
PISTON	lb	1145	1170	1170	1195	1214	1233	1258	1271	1315	1334	1360	1436
TOTAL	lb	5607	5767	5905	6067	6260	6417	6631	6731	7050	7232	7408	7982
PRESSURES:													
TOP	psig	110	110	110	110	110	110	110	110	110	110	112	112
PISTON	psig	181	185	186	188	192	195	199	201	208	211	215	227
BOTTOM	psig	180	182	186	188	192	199	199	201	207	211	215	227
DISPLACEMENTS	thou.	0.1	0.1	0.2	0.2	0.25	0.3	0.35	0.5	0.7	0.8	0.9	1.1

In the above results from Table 8.1 we observe that the pressure regulator maintains the upper manifold pressure constant at 110 psig as the applied load is increased. The shaft moves downwards with increasing applied loads and flows to the bottom recesses are thereby reduced with increase of bottom manifold pressures. Piston pressures are equal to bottom manifold pressures and rise in step with them. Piston loads thus increase as applied loads are increased, thereby accentuating the increase in total load. In Tests 8A a 47% increase in applied load is accompanied by a 25% increase in piston load. Flows to the upper pads remain fairly constant despite the increase in piston pressure. This would indicate that pad clearances are maintained.

TESTS 8B	8BA	8BB	8BC	8BD	8BE	8BF	8BG
LOADS:							
APPLIED lb	4012	5046	5735	6546	7152	7650	8241
PISTON lb	1151	1227	1328	1461	1568	1644	1707
TOTAL lb	5163	6273	7063	8007	8720	9294	9948
PRESSURES:							
TOP psig	90	91.5	92	92.5	94	94	96
PISTON psig	182	194	210	231	248	260	270
BOTTOM psig	181	194	209	231	248	260	271
DISPLACEMENTS thou.	-0.1	0.05	0.4	0.7	1.0	1.3	2.0

In Tests 8B, in which overload is continued up to elimination of bottom clearance, we observe the same behaviour as for Tests 8A. Here a 105% increase in applied load is accompanied by a 48% increase in piston load. At these high overloads we observe a slight reduction in pad recess flows.

The pressure regulating valve was was set at 110 psig for Tests 8A and then at 88 to 96 psig for all the remaining tests. The incorporation of this pressure regulator is considered to be technically justified since increases in upper recess flows are not helpful in supporting higher applied loads.

The absence of recess flow and Gemst totaliser readings for Tests 8AI to 8AM is explained by lack of testing time on that particular day.

Under conditions of rated load and nominal clearance the required pressure and flow can be supplied by both the KOBE and the PACO pumps. However, under overload, the KOBE pump is pressure limited whilst the PACO pump is not. This is clear from the pump characteristics, shown in Appendix A. The PACO pump can therefore sustain higher bearing loads. The pressure drops across the orifices, which are fixed for rated load conditions, will inevitably become less as as flows decrease. At zero flow, for example, recess pressure will be equal to supply pressure.

Water flowing through the bearing is subject to the combined pressure losses of the orifices ahead of the recesses and the escape gap after them. The pressures in, and the flows through, the recesses are functions of fixed size orifices upstream and a varying sized gap downstream. Both will vary with changes in load and prediction of their combined effect on recess conditions is a complex matter. However, it can be seen that the higher pressures provided by the PACO pump enable higher loads to be supported.

The patented stern tube bearing, on which the test bearing was based, is designed to support 125% of the nominal load imposed by the overhung weight of the propeller and shaft. The test bearing was scaled down to support a 100% load of 5275 lb (x lb applied plus y lb vertical load) at a nominal bottom clearance of 0.002 inches. An overload of 36.6% (Test 6K) was supported using the KOBE pump. With the PACO pump, capable of higher pressures, at the reduced flows resulting from shaft displacement, the journal made contact with the bearing surface at an overload of 88.6% (Test 8BG).

Although a higher pressure pump, such as the PACO pump, enables operation at these high levels of overload there is a penalty to be paid in terms of pumping power and cooling requirements. The test bearing would support higher overloads if supplied with higher pressure water. This would require higher pressure loss orifices in the lower bearing. Smaller orifices may be more likely to block, although there was no evidence of this happening with the smaller orifices fitted in the upper bearing pads. The operating parameters of such a bearing should be selected with these considerations in mind.

The following extracts from the Tables provide a comparison of the pressure and flow conditions supplied to the bearing by each pump at the moment of absorption of the clearance:

TEST Pump	Ratio of Applied to Total Load	Over load above Total	Top Recesses		Bottom Recesses		Bottom Manifold	Displacement of Shaft Axis
	%	%	igpm	psig	igpm	psig	psig	in
6K KOBE	84.0	36.6	8.88	51.4	3.35	181.3	184.6	0.0020
8BG PACO	82.8	88.6	4.27	-	6.12	-	271	0.0020

The marked reduction in flow to the top bearing (4.27 igpm in 8BG compared to 8.88 igpm in 6K) is significant, indicating a reduction of clearance between the pads and the shaft under higher piston loadings.

When interpreting the overload figures above it should be remembered that they are expressed in terms of a rated load whose definition (given in Section 1.4.3.) is particular to the model test bearing. It is the rated load-carrying capacity of the bottom half alone and thereby includes load due to the thrust of the pistons in the top half. In the case of production bearings overloads are expressed in terms of the rated capacity of the complete bearing to carry externally-applied load. For this model bearing under test externally-applied load is termed Applied Load. Applied Load plus Piston Load gives Total Load, the load experienced by the bottom half.

5.9 Test Series 9 - Rated Loads and Constant Overloads, Increasing Speeds, PACO Pump

At increasing levels of speed, Tests 9A were conducted about 6% above rated load, Tests 9B at 33% overload and Tests 9C at 65% overload.

5.9.1 Test Series 9 - Objectives

This series of tests examined the above loadings on the bearing with the shaft turning.

5.9.2 Test Series 9 - Results

The results are shown in Tables 9.0, 9.1 9.2 and 9.3. A comparison of the bearing performance under the same shaft displacement with the shaft stopped and running at full speed is given by the following extracts from the tables:

TEST	Shaft rpm	Total load	Over load	Top Recesses		Bottom Recesses		Bottom Manifold	Displacement of Shaft Axis
		lb	%	igpm	psig	igpm	psig	psig	in
8BE	Nil	8720	65.3	4.40	-	7.77	-	248	0.0010
9CF	550	8713	65.2	4.33	-	7.91	-	248	0.0010

A comparison of the results Tests 9CF and 7E is made below. These two tests were conducted at approximately the same shaft displacement and speeds but with different pressure supply conditions.

TEST	Shaft rpm	Pump	Total load	Appl. load	Top Manifold		Bottom Manifold		Piston Pressure	Displacement of Shaft Axis
			lb	lb	igpm	psig	igpm	psig	psig	in
7E	554	KOBE	6597	5462	8.81	164.4	6.47	182.7	179.5	0.0009
9CF	550	PACO	8713	7150	4.33	96	7.91	248	247	0.0010

5.9.3 Test Series 9 - Discussion of Results

As far as can be judged in the absence of recess pressures, conditions within the bearing under overload seem to be unaffected by rotation of the shaft. This same conclusion was first drawn from the results of Test Series 7.

Although the total load in the case of Test 9CF was 2,116 lb greater than for Test 7E, 428 lb (approximately 20% of this increase) can be attributed to the additional internally generated load resulting from the higher pressure supplied to the top pistons.

In Test 7E the recess pressures in the upper bearing averaged 51.2 psig with a manifold pressure of 164.4 psig, the 113.2 psig pressure difference (164.4 - 51.2) being the pressure loss across the orifices.

Unfortunately, upper bearing recess pressures could not be measured in Test 9CF. However, it can be inferred that the recess pressures were higher in Test 9CF than in Test 7E in order to balance the higher piston load. This was achieved in spite of the lower upper bearing manifold pressure of 96 psig (compared to that of 164.4 psig in Test 7E) by loss of clearance between the pads and the shaft. The total flow to the top of the bearing was thus reduced to less than a half of that recorded in Test 7E reducing, as a result, the pressure drop across the orifices.

In terms of the carrying capacity of the lower bearing at a shaft displacement of approximately 0.001 inches, a comparison of the two tests indicates that a 36% increase in the bottom manifold supply pressure is required for a total load increase of 32%.

5.10 Test Series 10 - Rated Load and Overload Modified Bottom Half Bearing

Before these and later series of tests the bottom half bearing design was changed by a modification which, with the journal concentric in the bearing, effectively reduced the length of the escape gap from 50.12 inches to 31.97 inches. Details of this modification are given in 2.3. Tests at increasing speeds were performed, firstly tests 10A at rated load and and then tests 10B at 28% overload. These were followed by tests 10C in which high degrees of overload were applied to the stationary shaft.

5.10.1 Test Series 10 - Objectives

To investigate the load-carrying capacity of the bearing and the pressure and flow conditions within it with a modified bottom half.

5.10.2 Test Series 10 - Results

Results are given in Tables 10.0, 10.1, 10.2 and 10.3. The following extracts from the tables compare the conditions in the bearing before and after modification at near rated load and full speed:

TEST	Modified	Shaft rpm	Total load	Top Recesses		Bottom Recesses		Bottom Manifold	Displacement of Shaft Axis
			%	igpm	psig	igpm	psig	psig	in
9AF	No	550	106.5	4.75	-	14.59	-	181	0.0001 up
10AF	Yes	554	101.7	5.37	-	8.81	-	138	0.0000

These figures clearly demonstrate the extent to which load-carrying capacity is increased as a result of the modification. By shortening the escape gap flows through the bottom half of the bearing were reduced at comparable load and clearance conditions. The central annulus, which formerly was open to ambient pressure, was sealed at both ends. This modification effectively increases the load-bearing area of the bearing. Water pressure in this annulus was measured and was found to be equal to the average of the adjacent recess pressures.

The following extracts illustrate the effect of the modification on the maximum overload capacity of the bearing:

TEST	Modified	Shaft rpm	Over load	Top Recesses		Bottom Recesses		Bottom Manifold	Displacement of Shaft Axis
			%	igpm	psig	igpm	psig	psig	in
8BG	No	Nil	88.6	4.27	-	6.12	-	271	0.0020
10CD	Yes	Nil	81.4	4.47	-	9.98	-	245	0.0007

5.10.3 Test Series 10 - Discussion of Results

The overload capacity of the bearing is, evidently, considerably improved by the modification. Whereas, before modification, metallic contact occurred at 88.6% overload, the modification would permit running under 81.4% overload at a radial clearance of 0.0013 in. Comparative readings for the same value of shaft displacement are given by 8BD and 10CD:

TEST	Modified	Shaft rpm	Over load	Top Recesses		Bottom Recesses		Bottom Manifold	Displacement of Shaft Axis
			%	igpm	psig	igpm	psig	psig	in
8BD	No	Nil	51.8	4.68	-	9.56	-	231	0.0007
10CD	Yes	Nil	81.4	4.47	-	9.98	-	245	0.0007

Examination of the tabulated results shows flows and pressures (where recorded) to be comparable in all parts of both halves of the bearing during the above two tests. Lack of readings of recess pressure is regrettable since they evidently increased to support an extra 1561 lb of load.

In order to achieve the high overloads in Test 10C it was necessary to reduce the flow to the bearing by manually throttling the flow to the upper bearing manifold.

The modification is seen to have provided a 29.6% increase in carrying capacity for the same shaft displacement at the expense of a modest increase in hydraulic hp from 2.30 to 2.48.

5.11 Test Series 11 - Rated Vertical and Increasing Lateral Load, Shaft Stopped

A mechanism (Appendix E, Figure 3) was erected for the simultaneous application of lateral and vertical loads. With the rated vertical load applied to the shaft, lateral loads of increasing value were applied.

5.11.1 Test Series 11 - Objectives

To investigate the ability of the bearing to carry steady lateral load and to record pressure and flow conditions within it with the shaft stopped.

5.11.2 Test Series 11 - Results

The results are shown in Tables 11.0 and 11.1 in which positive values of lateral load indicate direction of action from starboard to port.

The horizontal radial clearance was reduced to 0.00015 inches in Test 11E under a lateral load of 767 lb, equivalent to 14.5% of the rated vertical load, under the following conditions of pressure and flow:

TEST	Load		Top Recesses		Bottom Recesses		Bottom Manifold	Lateral Displacement of Shaft Axis
	Vert.	Lat.						
	%	%	igpm	psig	igpm	psig	psig	in
11E	100	14.5	5.16	38.3	10.04	128	145	0.00185

5.11.3 Test Series 11 - Discussion of Results

The lateral load was limited to a maximum of 767 lb in view of the limited support area offered by the lower half bearing. The upper pads, integral with the sliding pistons, offer little lateral support to the shaft.

5.12 Test Series 12 - Rated Vertical and Increasing Lateral Load, Constant rpm

Having established the capacity of the bearing to accept lateral loads with the shaft at rest, tests were repeated with the shaft running. Because previous tests have shown that speed is not a factor in the hydraulic performance of the bearing, the speed during these tests was limited to 40% of full speed. This measure was taken to reduce the extent of damage in the event of the shaft touching the bearing. With rated vertical load applied, lateral load was exerted in increments up to 14.5% rated load as in the previous test series.

5.12.1 Test Series 12 - Objectives

To investigate the bearing's capacity to carry lateral loads with the shaft running and to record the internal conditions of pressure and flow.

5.12.2 Test Series 12 - Results

The results are shown in Tables 12.0 and 12.1.

A comparison of the conditions with the shaft running and the static conditions of Test 11E is given by the following extracts from the tables:

TEST	Load		Top Recesses		Bottom Recesses		Bottom Manifold	Lateral Displacement of Shaft Axis
	Vert.	Lat.						
	%	%	igpm	psig	igpm	psig	psig	in
11E	100	14.5	5.16	38.3	10.04	128	145	0.00185
12G	100	14.5	5.30	38.0	9.85	127.7	144.2	0.00185

5.12.3 Test Series 12 - Discussion of Results

Once again it is seen that rotation of the shaft exerts no significant influence on the conditions within the bearing.

5.13 Test Series 13 - Rated Vertical and Impulsive Lateral Load, Constant rpm

From this test series onwards readings were recorded by a data logger.

Four groups of tests were conducted, each for a different frequency of application of lateral load. These were: 13A - Constant load; 13B - 1 Hz; 13C - 2 Hz and 13D - 4 Hz.

The shaft was turned at 115 rpm under rated vertical load in each test. At each of the above frequencies the lateral load was increased from zero to 767 lb (14.5% rated load).

5.13.1 Test Series 13 - Objectives

To investigate the ability of the bearing to carry cyclic lateral loads such as are experienced by stern tube bearings due to the hydrodynamic interaction of propeller blades with the hull.

5.13.2 Test Series 13 - Results

These are shown in Tables 13.0, 13.1, 13.2, 13.3 and 13.4.

5.13.3 Test Series 13 - Discussion of Results

It was shown that impulsive lateral loads could be accommodated within the range of operating conditions imposed during the tests of steadily applied lateral load of Test Series 11.

The tests of 13A, in which the lateral load was steadily applied, were virtually a repeat of Test Series 11 except that the shaft was turning and measurements were taken by data logger instead of visually. A certain degree of correspondence between the results was therefore to be expected. The following extracts show that it was obtained:

TEST	Total Load	Lateral Load	RPM	Top Manifold		Bottom Manifold		Piston Pressure	Lateral Shaft Displacement
	lb	lb		igpm	psig	igpm	psig	psig	inches
11B	5288	203	0	5.23	86	9.70	147	147	0.0010
13A-90C	5275	202	115	5.79	87	10.11	145	147	0.0010
11C	5281	484	0	5.16	86	9.84	147	146	0.0015
13A-90E	5275	484	115	5.83	86	10.60	146	146	0.0015

The lateral displacement of the shaft under steady lateral loading was not increased by its impulsive application at frequencies of 1, 2 and 4 Hz. This is clear from the following extracts:

TEST	Total Load	Lat. Load	Hz	RPM	Top Manifold		Bottom Manifold		Piston Pressure	Lateral Shaft Displacement
	lb	lb			igpm	psig	igpm	psig	psig	inches
13A-90E	5275	484	0	115	5.83	86	10.60	146	146	0.0015
13B-90E	5275	484	1	115	5.77	87	10.12	145	146	0.0015
13C-90E	5275	484	2	115	5.78	86	10.34	146	146	0.0015
13D-90E	5275	484	4	115	5.81	87	10.36	147	147	0.0015

Lateral shaft displacements remain the same for each magnitude of lateral loading irrespective of the frequency up to the maximum lateral load of 767 lb:

Lateral load	lb :	484	625	767
Lateral Displacement	inch :	0.0015	0.0016	0.0017

Coefficients of friction, however, tend to decrease with increasing frequency, especially at the higher lateral loads, as the following results show:

		Coefficients of Friction			
Frequency Hz		0	1	2	4
Load lb	Disp. inch.				
101	0.0005	0.00253	0.00256	0.00256	0.00250
202	0.0010	0.00233	0.00256	0.00256	0.00275
343	0.0013	0.00244	0.00250	0.00250	0.00250
484	0.0015	0.00358	0.00250	0.00250	0.00250
625	0.0016		0.00272	0.00269	0.00253
767	0.0017		0.00329	0.00291	0.00263

5.14 Test Series 14

Increasing Vertical Overload, Shaft Stopped

The conditions of this series of tests were similar to those of Tests 10A and 10B, shown in Tables 10.1 and 10.2.

5.14.1 Test Series 14 - Objectives

This was a short preliminary to the next series of tests in which the shaft was running. It was also the first test in which the data logger was used in vertical loading.

5.14.2 Test Series 14 - Results

These are shown in Table 14.1.

5.14.3 Test Series 14 - Discussion of Results

Overload was progressively increased to 50% above the rated load which, in 14-101D extended loading conditions beyond those applied in Tests 10A and 10B.

5.15 - Test Series 15

Increasing Vertical Overload, Shaft Running

The loading conditions of these tests were similar to those of Test Series 14 except that the shaft was running.

5.15.1 Test Series 15 - Objectives

To investigate the bearing's ability to support extreme values of steady vertical overload with the shaft running.

5.15.2 Test Series 15 - Results

These are given in Table 15.1

5.15.3 Test Series 15 - Discussion of Results

The conditions in the bearing were similar to those of Test Series 14 as the following extracts from the tables show:

TEST	Applied Load	Total Load	Shaft rpm	Top Manifold		Bottom Manifold		Piston Pressure	Displacement of shaft
	lb	lb		igpm	psig	igpm	psig	psig	inches
14-101D	7175	8252	0	5.65	91	4.55	175	175	0.0008
15-107C	7765	8789	90	5.89	89	7.18	161	162	0.0011

The bottom manifold pressure is seen to be very sensitive to shaft displacement as the running clearance at the bottom is absorbed. To minimise the consequences of contact of the rotating shaft with the bearing speed was progressively reduced throughout this series.

5.16 Test Series 16 - Constant Impulsive Vertical Overload, Constant Speed

In this test series rated load was applied vertically to the bearing which was then subjected to impulsive overloads at various frequencies. The loading weights were replaced by a spring in these tests in order to reduce the inertia of the loading system.

5.16.1 Test Series 16 - Objectives

To investigate the ability of the bearing to sustain impulsive vertical loading.

5.16.2 Test Series 16 - Results

These are given in Tables 16.1, 16.2 and 16.3.

5.16.3 Test Series 16 - Discussion of Results

In two test runs, at overloads of 33% and 66%, the ability of the running bearing to sustain impulsive loading at frequencies of 1, 2 and 4 Hz was investigated. As was found to be the case under lateral vibratory loading in Test Series 13, the shaft displacements thereby produced were independent of the frequency within this range. This is illustrated by the following extracts from the tables for the run at 66% overload:

TEST	Total Load	Hz	RPM	Top Manifold		Bottom Manifold		Piston Pressure	Lateral Shaft Displacement
	lb			igpm	psig	igpm	psig	psig	inches
16C-107G	8789	0	90	5.91	89	7.02	162	162	0.0011
16C-107H	8694	1	101	5.68	85	8.70	148	147	0.0010
16C-107I	8713	2	101	5.65	85	7.69	154	150	0.0010
16C-107J	8744	4	101	5.79	85	8.57	149	155	0.0010

The same tendency for a reduction in coefficient of friction with increasing frequency was also noted.

It would seem clear that, whether the loading be vertical or lateral, to apply loads of this order of magnitude impulsively is no more severe a test of the bearing than to apply them steadily. It has been shown that this type of bearing provides viscous damping of a very high order and that, whether the load be constant or impulsive, the shaft centre moves to a position of hydrodynamic balance corresponding to its magnitude and stays there.

5.17 Test Series 17 - Impulsive Vertical Overload with Air Vessels of Increasing Size

For these tests a small air vessel was mounted on the cylinder head of each of the four pistons. The purpose of these air vessels is to obviate hydraulic locking of the pistons by their associated non-return valves which might prevent the shaft from rising clear of the lower bearing on start up. In the absence of air vessels the shaft was allowed to rise by venting water from small bleed valves on each cylinder head on each occasion of preparing the model bearing for test.

under conditions of constant rated vertical load an overload of 97% was applied impulsively at four different frequencies. The test was repeated for air vessels of four different volumes.

5.17.1 Test Series 17 - Objectives

These were to investigate the effect of incorporating air cushion vessels of different sizes in the piston cylinder heads on the vibratory characteristics of the shaft within the bearing.

5.17.2 Test Series 17 - Results

These are given in Table 17.1.

5.17.3 Test Series 17 - Discussion of Results

The tabulated results do not reveal any apparent tendency for shaft displacement figures to change with the sizes of the air vessels fitted. The oscilloscope photographs of Appendix B are particularly consistent and such variations as are recorded could be accounted for by the normal errors and scatter in the taking of readings. The oscilloscope readings of test sheets 120 and 127, those of zero and largest volume respectively, are almost identical.

As well as allowing the shaft to rise to its running position without venting on start up this test series also revealed that air vessels permit a separation of upper and lower peak displacements under implusive loading and thus provide a certin cushioning effect. Differences in air volume, however, had no noticable effect.

5.18 Test Series 18 - Vibration Readings of Bearing

Shaft vibration in the vertical, lateral and longitudinal directions was monitored by sensors mounted on the outer race of the load-applying ball bearing. On the charts of Figures 2a to 2i are plotted the principal peak values from the velocity decibel/frequency spectra obtained under conditions of steady vertical overload at three speeds of rotation: 114, 347 and 555 rpm. In no case was the severity of the vibration worse than 99 dB, a level classed as GOOD by the International Research and Development Corporation of Worthington, Ohio, (reproduction of whose General Machinery Vibration Severity Chart is gratefully acknowledged). All but four of the thirty-eight readings fall onto the SMOOTH, VERY SMOOTH and EXTREMELY SMOOTH areas of the chart.

5.19 Test Series 19 - Torque Tests

Stern tube bearings have to resist the axial misalignments that are imposed as the ship's hull hogs and sags in a seaway. The angular stiffness of this model prototype was therefore investigated in the test rig. Rated load was applied to the stationary shaft which, centred within the bearing, registered floats of approximately 0.002 inches at each end at zero torque. Torque was then applied with a standard torque wrench causing the bearing to tilt in its pivot support. Changes of shaft float at the ends were measured by clock gauges at equal increments of steadily applied torque, both rising and falling.

The jaws of the wrench were supported on a steel block which, by providing a reaction to the downward force at the end of the arm of the wrench, ensured that a pure couple was applied to the bearing.

5.19.1 Test Series 19 - Objectives

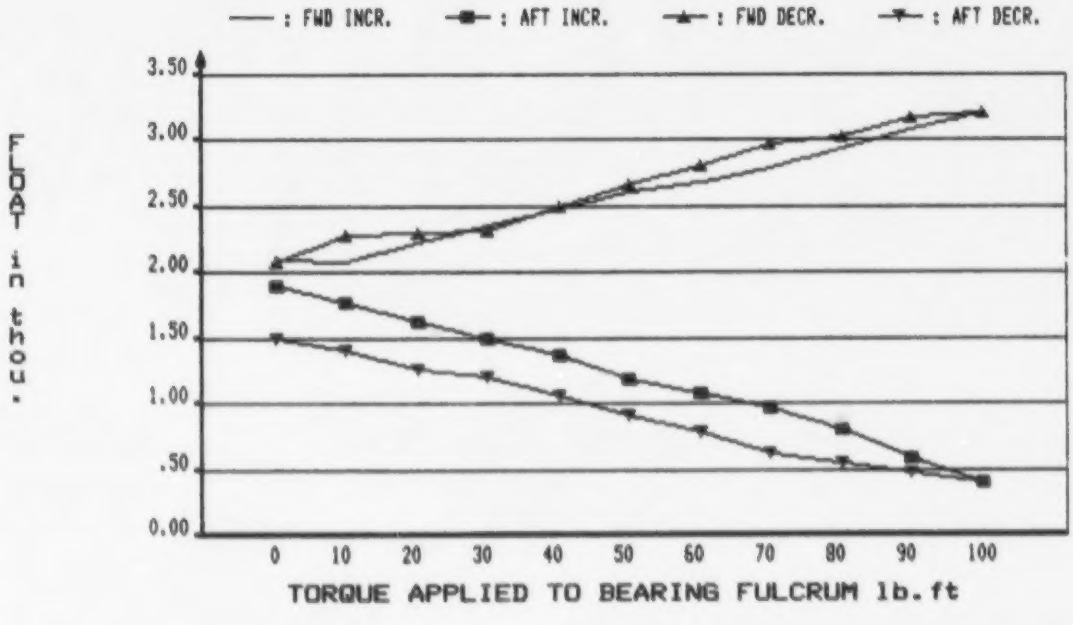
To investigate the variation of clearance of the shaft at each end of the bearing as torque is applied about a lateral axis and to predict the value of torque at which contact of the shaft with the bearing will occur.

5.19.2 Test Series 19 - Results

These are summarised in the table and plotted below:

	APPLIED TORQUE lb.ft										
	0	10	20	30	40	50	60	70	80	90	100
SHAFT END FLOATS thou.											
	UNDER INCREASING TORQUE										
FWD	2.10	2.08	2.23	2.36	2.48	2.60	2.68	2.78	2.93	3.08	3.20
AFT	1.90	1.77	1.63	1.49	1.36	1.18	1.08	0.97	0.80	0.58	0.40
	UNDER DECREASING TORQUE										
FWD	2.08	2.28	2.30	2.32	2.50	2.67	2.80	2.98	3.03	3.17	3.20
AFT	1.50	1.40	1.25	1.20	1.06	0.92	0.78	0.62	0.54	0.48	0.40

TORQUE TESTS



5.19.3 Test Series 19 - Discussion of Results

Extrapolating the after end float curve for increasing torque indicates that shaft/bearing contact will occur at about 130 lb.ft. It is seen that 100 lb.ft of torque causes the after end bottom float to decrease by about 0.0015 inches. The axial stiffness of this bearing, under torques applied in the vertical plane through the shaft axis, appears to be constant at a value (expressed in terms of end clearance) of about 66 lb.ft/thou.

5.20 Test Series 20 - Investigation into the Characteristics of the Modified Bearing

5.20.1 Test Series 20 - Objectives

To provide flow, pressure and displacement data for a thorough analysis of the characteristics of the modified hydrostatic bearing under a range of constant applied loads from 1000 lb to 9000 lb including the rated load. At each value of load, bottom manifold pressures were reduced, in steps, to bring the shaft down from concentricity to mechanical contact with the bearing. Manifold pressures were then increased, in steps, to raise to shaft back to concentricity again. Tests suffixed "A" are of decreasing pressure and those suffixed "B" are of increasing pressure. After each adjustment of pressure a complete set of flow, pressure and float readings was taken.

5.20.2 Test Series 20 - Results

These are contained in Tables 20.0A/B to 20.9A/B.

5.20.3 Test Series 20 - Discussion of Results

This is conducted in Section 7 - Summary and Discussion of the Test Results.

FIGURE 2a. SHAFT VIBRATION LEVELS AT 114 RPM STEADY VERTICAL OVERLOAD - VERTICAL

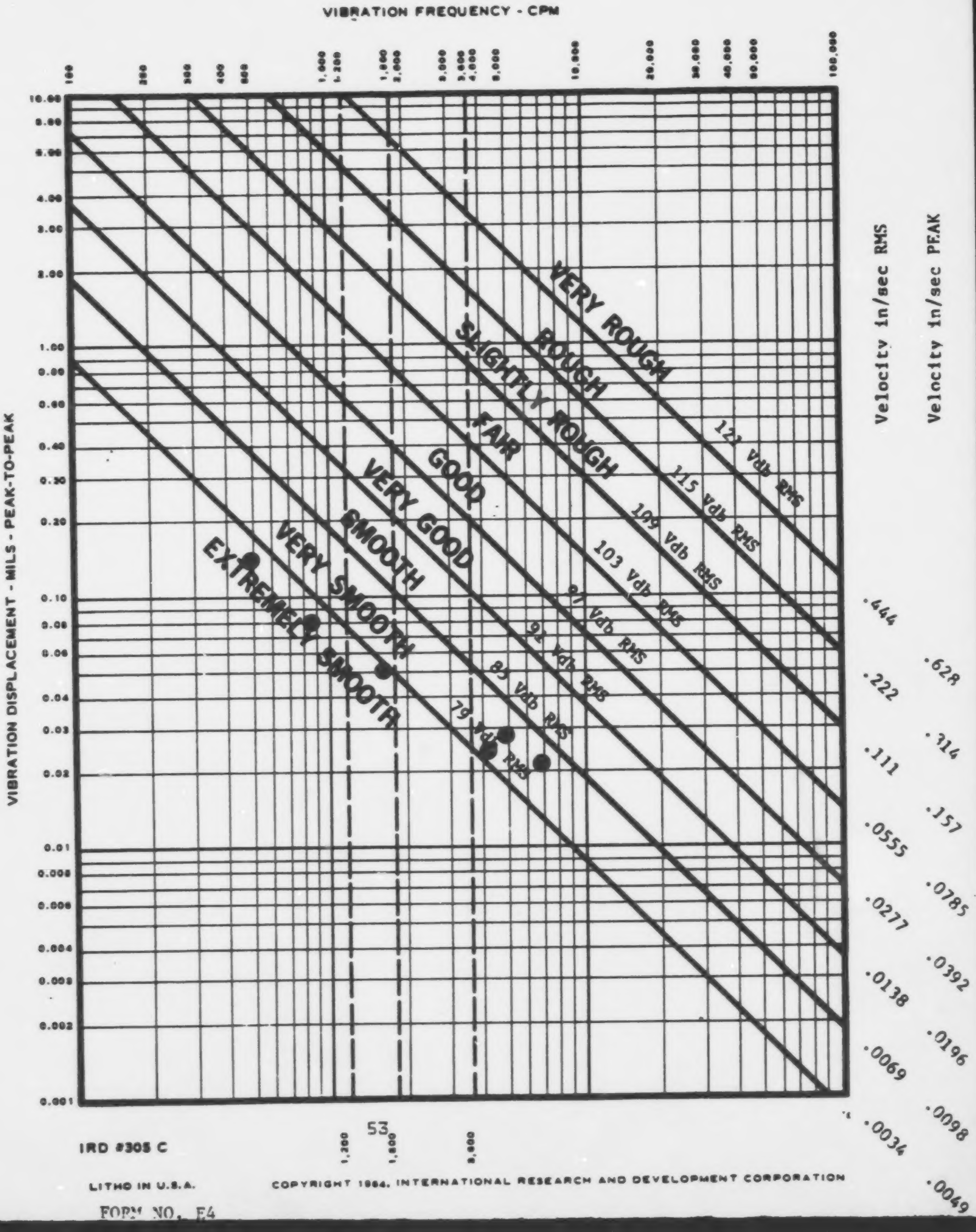


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FIGURE 2b. SHAFT VIBRATION LEVELS AT 347 RPM
STEADY VERTICAL OVERLOAD - VERTICAL

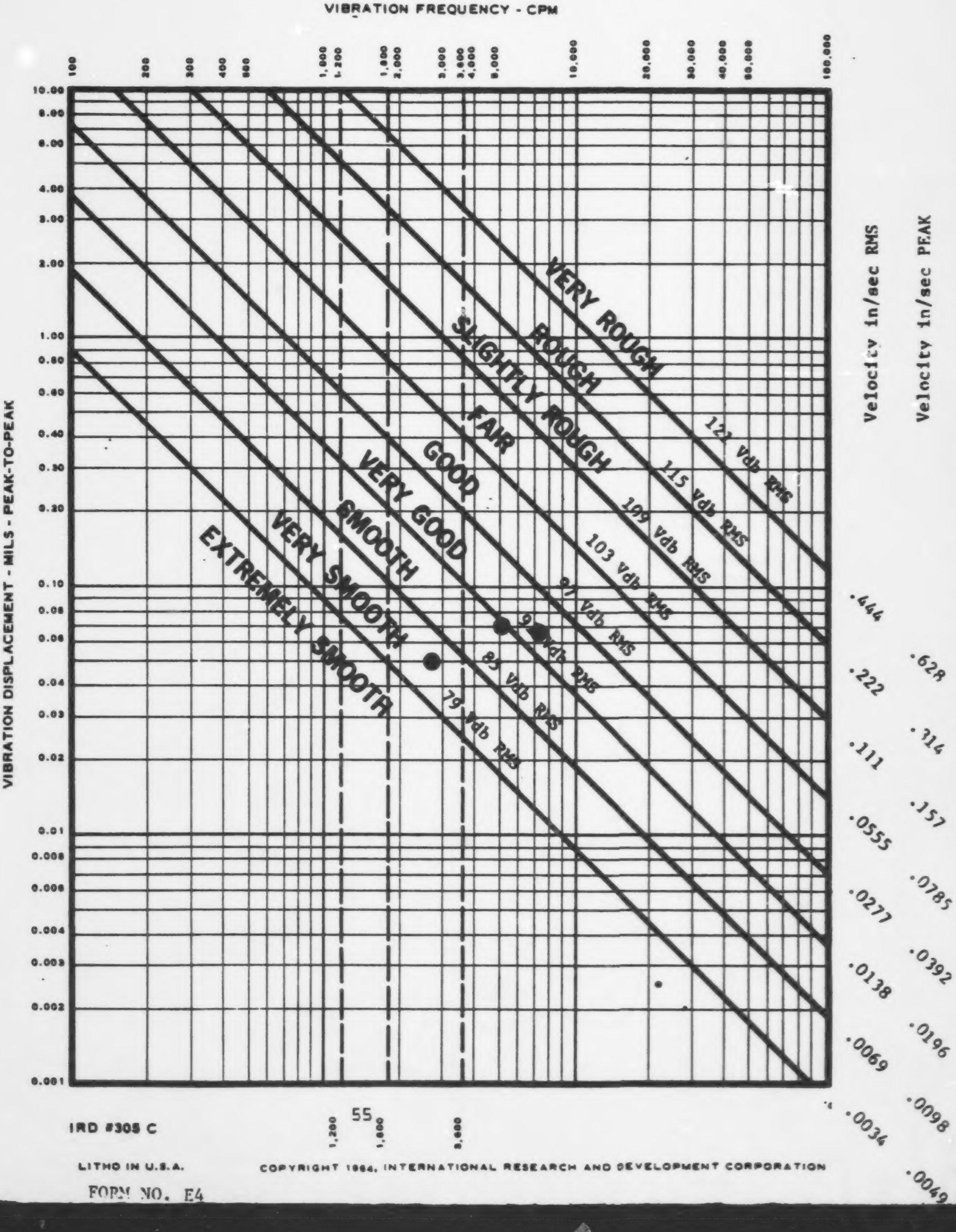

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FIGURE 2c. SHAFT VIBRATION LEVELS AT 555 RPM STEADY VERTICAL OVERLOAD - VERTICAL

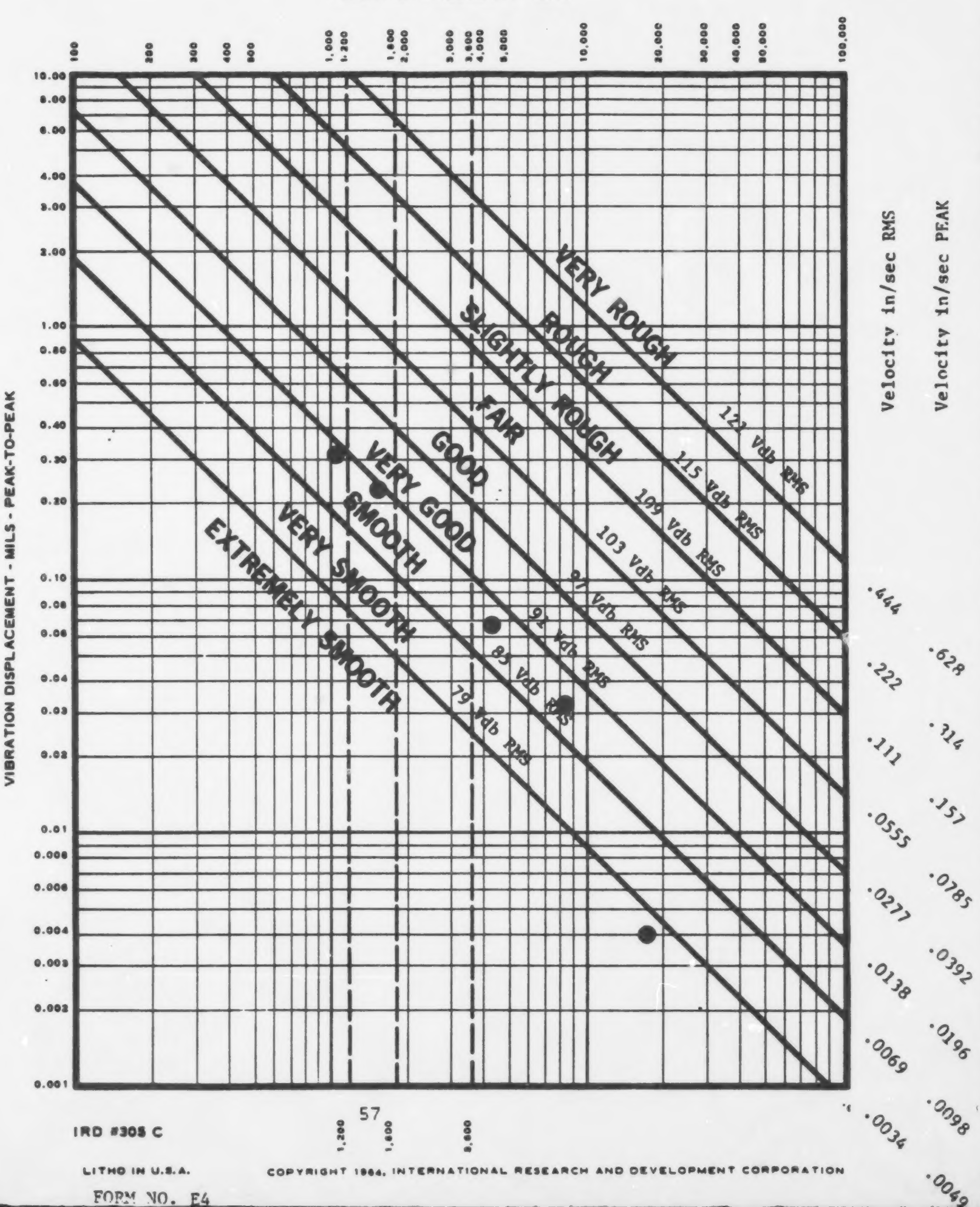

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FIGURE 2d. SHAFT VIBRATION LEVELS AT 114 RPM
STEADY VERTICAL OVERLOAD - LATERAL

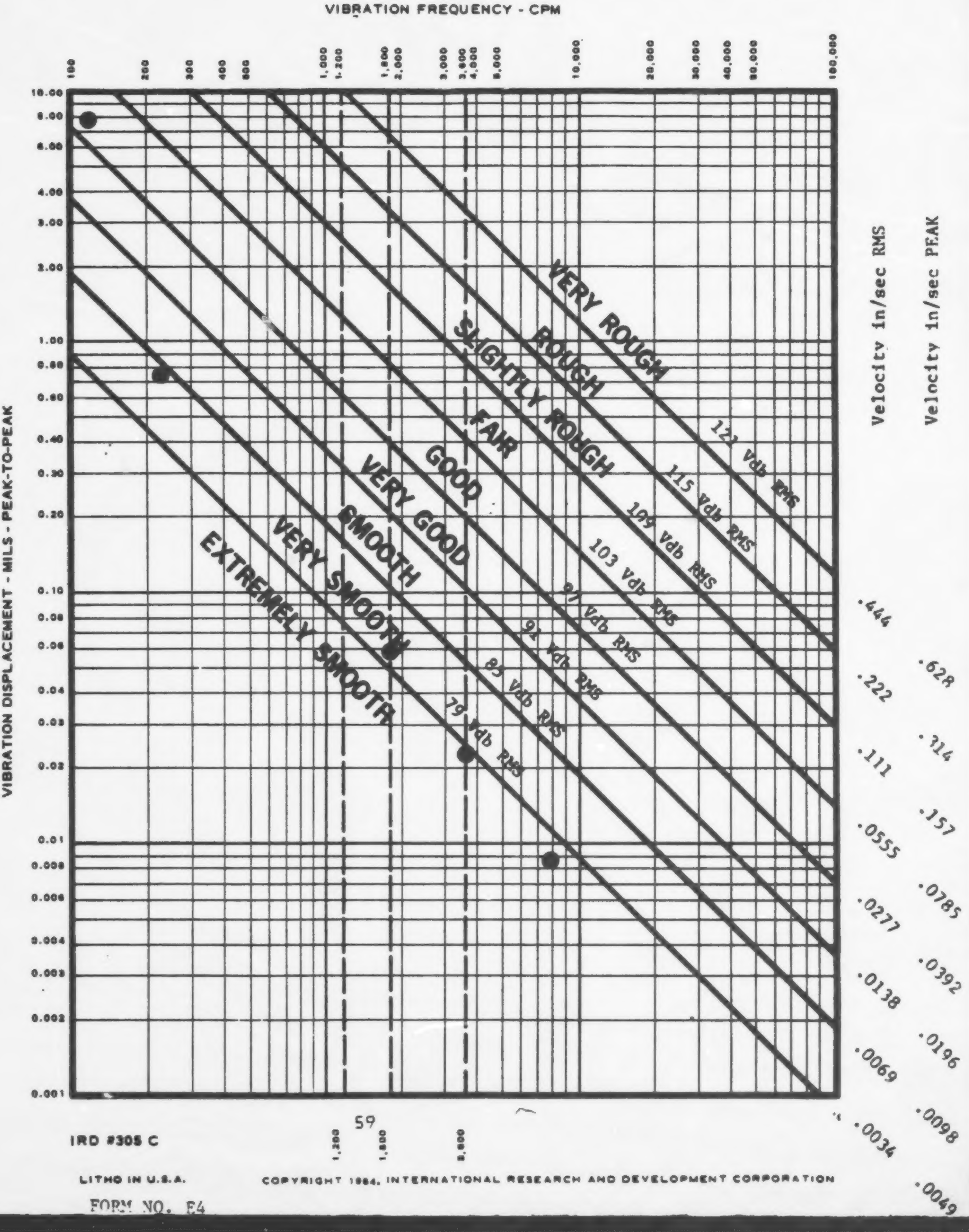

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FIGURE 2e. SHAFT VIBRATION LEVELS AT 347 RPM STEADY VERTICAL OVERLOAD - LATERAL

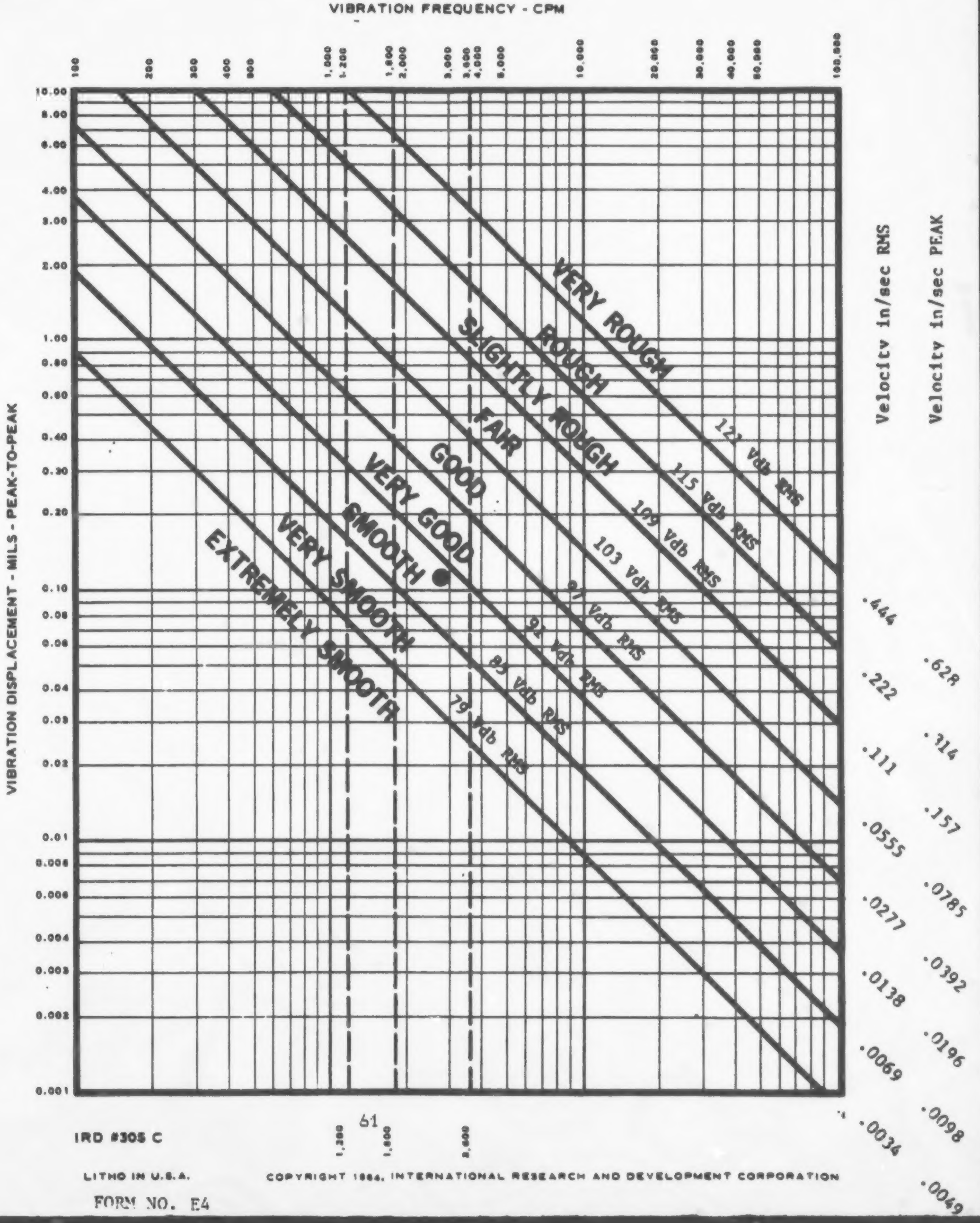

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FIGURE 2f. SHAFT VIBRATION LEVELS AT 555 RPM STEADY VERTICAL OVERLOAD - LATERAL

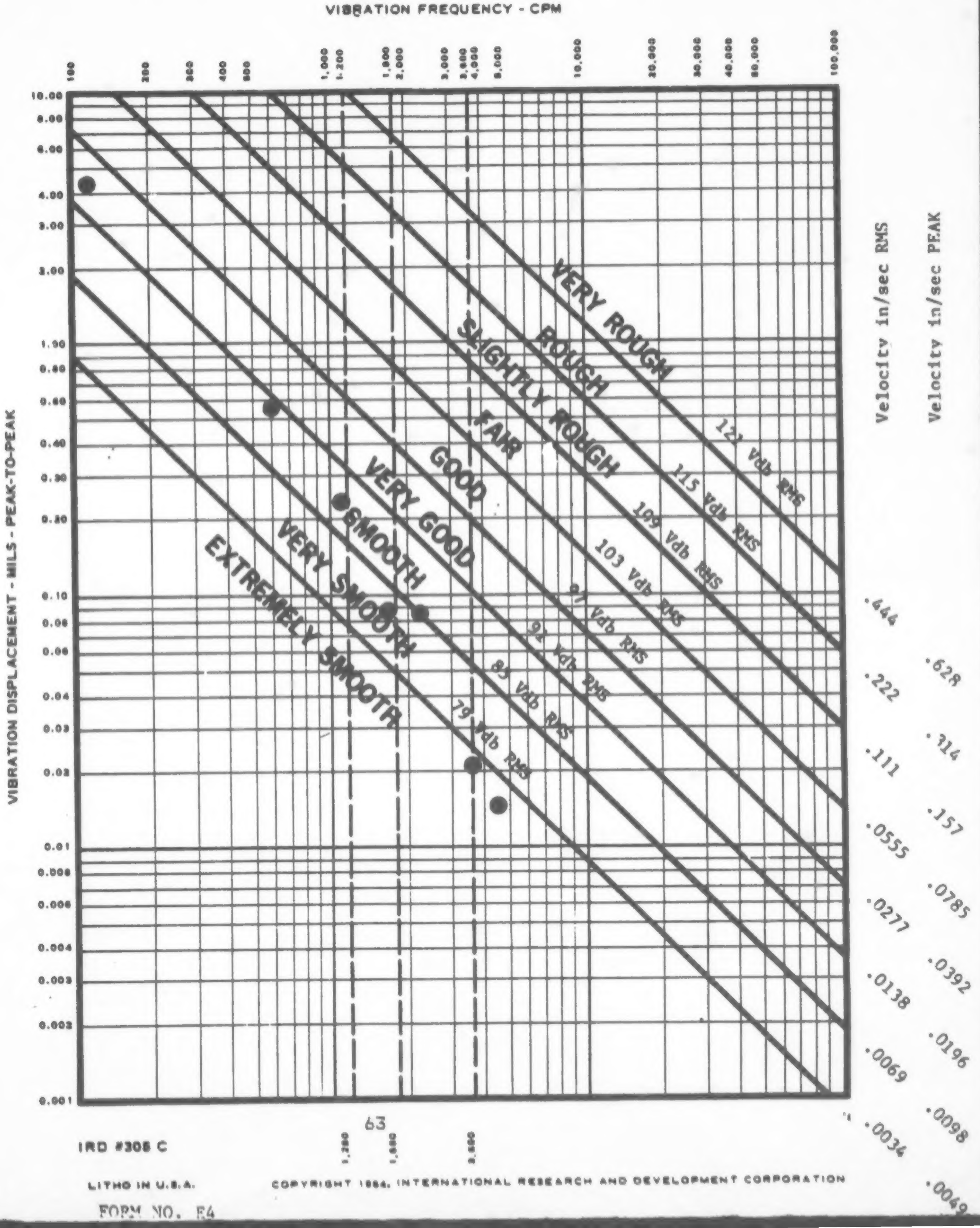

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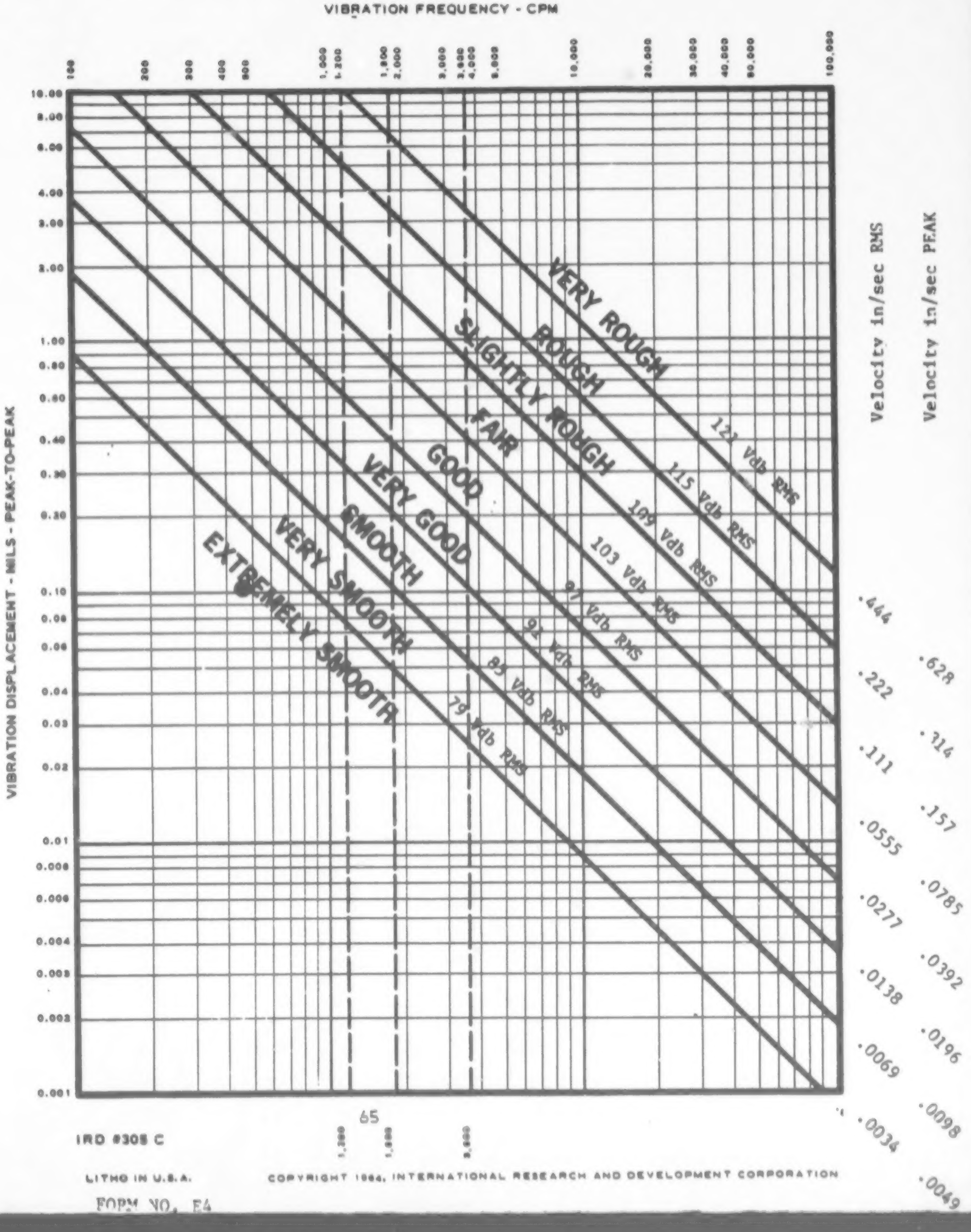
FIGURE 2g. SHAFT VIBRATION LEVELS AT 114 RPM
STEADY VERTICAL OVERLOAD - LONGITUDINAL



IRD #305 C

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FIGURE 2h. SHAFT VIBRATION LEVELS AT 347 RPM STEADY VERTICAL OVERLOAD - LONGITUDINAL

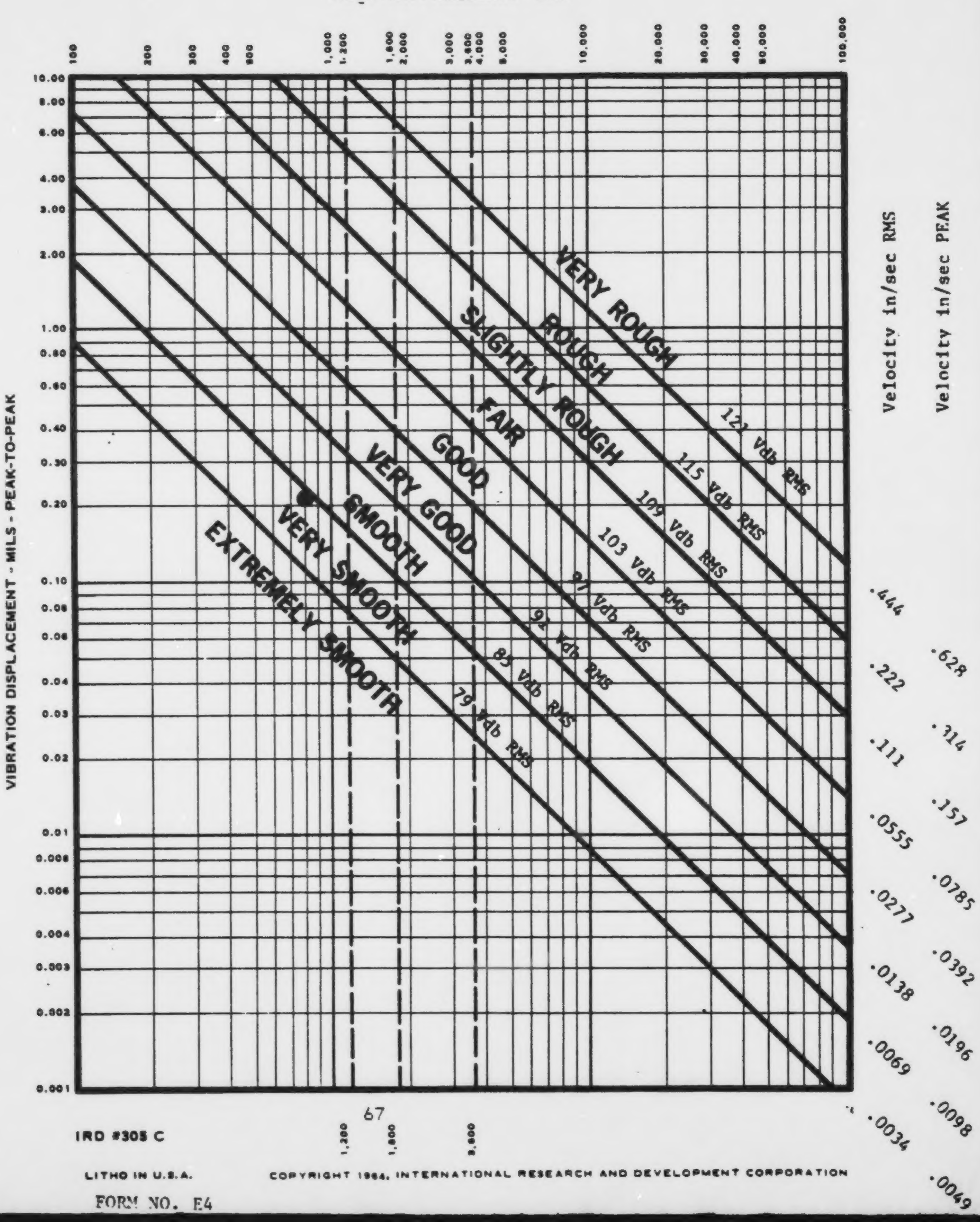

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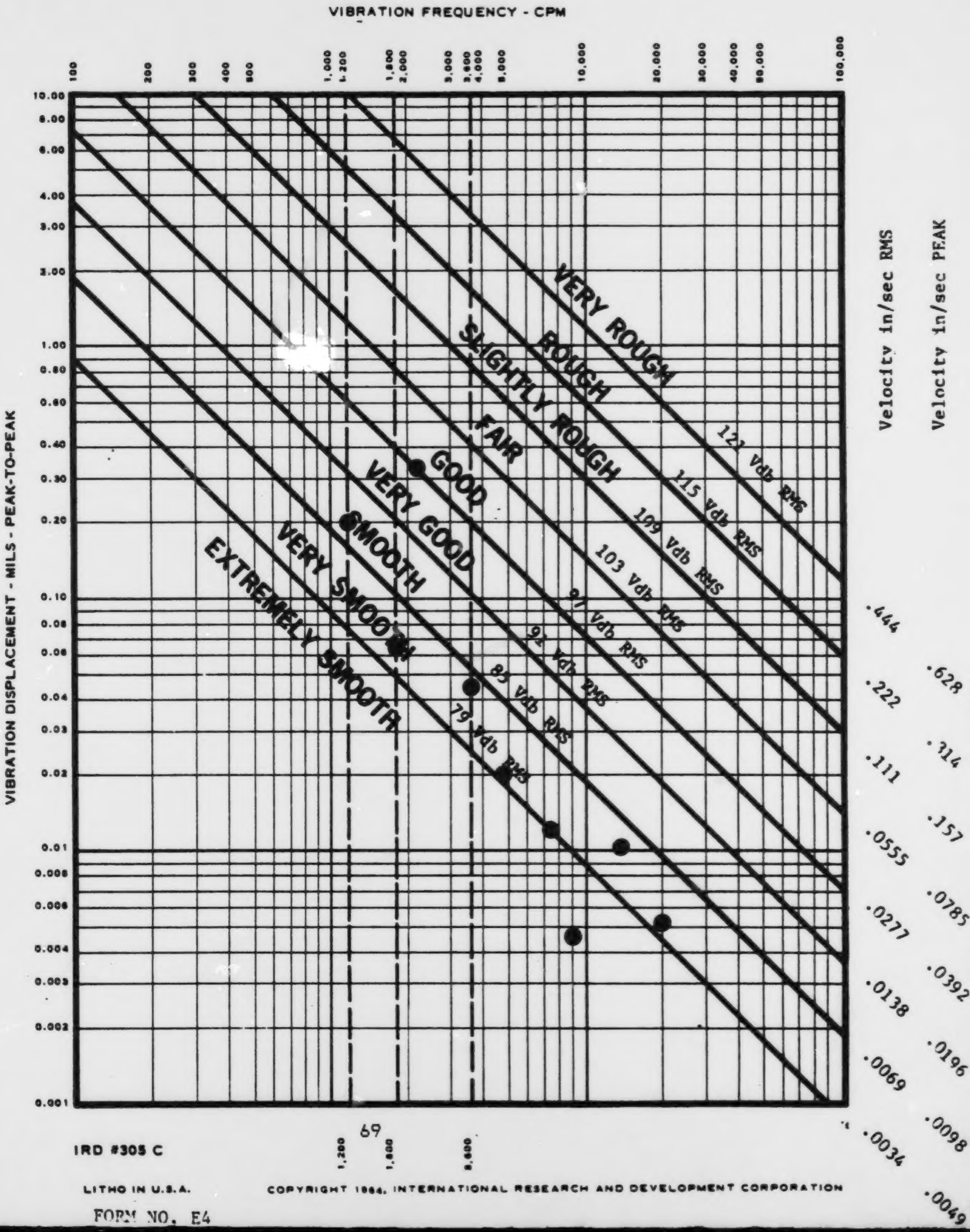
FIGURE 2i. SHAFT VIBRATION LEVELS AT 555 RPM
STEADY VERTICAL OVERLOAD - LONGITUDINAL



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FORM NO. E4

6.0 BEARING INSPECTIONS DURING AND AFTER TESTING

6.1 Inspections During Testing

On completion of Tests Series 4 the bearing had logged 37 hours of operation, including 4 hours rotating. It was then stripped down for examination. The bearing and shaft surfaces were found to be unmarked. Neither bore any visible sign of metallic contact.

On completion of Test Series 10 the bearing had logged 47 hours of operation, of which 11 under rotation and it was again stripped down for inspection. The components were found to be in an entirely satisfactory condition with no evident marks of running contact on the surfaces of the bearing or the journal.

6.2 Inspections after Testing

On completion of Test Series 18 the bearing had logged 165 hours of operation of which 89 were under rotation. It was then stripped for final examination.

The bored bearing surfaces of the top and bottom halves were checked for wear and dimensional accuracy on a surface plate. The reports of the final inspection are shown in Appendix C. Some traces of calcium salts were found. There was also slight evidence of contact which would have occurred whilst exploring the bearing's ultimate load-carrying capacity.

7.0 SUMMARY AND DISCUSSION OF THE TEST RESULTS

7.1 General

Each of the twenty series of tests performed on the model bearing revealed a separate aspect of its performance. The findings of the tests are summarised below. The numbers in this list correspond to the Test Series numbers and Table numbers of the test results. The bearing was modified from Test Series 10 onwards.

1. Under the rated load the shaft was lifted to a coaxial position with the bearing by supplying water under pressure to the lower bearing recesses.

2. The bearing supported the shaft under rated load whilst maintaining design clearances with the top and bottom bearing surfaces and with the shaft running at rated speed.

3. The bearing also supported its rated load with flow-metering orifices fitted in the supply connections to the recesses.

4. The parameters of bearing performance in sea water and in fresh water were found to be identical.

5. Without orifices, the bearing showed itself capable of sustaining about 29% vertical overload before absorption of the bottom clearance with a bottom manifold pressure range of 159.9 to 168.5 psig.

6. With orifices, the bearing was initially stiffer at small displacements but decreasing stiffness led to shaft-bearing contact at about 37% vertical overload with a bottom manifold pressure range of 175.2 to 184.6 psig.

7. The bearing's overload capacity was found to be unaffected by rotation of the shaft.

8. With water supplied from a pump having a steep pressure rise with reduced flow characteristic, the bearing supported a shaft overload of 89% before shaft/bearing contact with a bottom manifold pressure range of 181 to 271 psig.

9. With this type of pump the bearing's overload capacity was, again, found to be unaffected by rotation of the shaft.

10. With the length of the bottom half water escape gap reduced (by sealing off the ends of the central annulus) the bearing was able to support comparable loads at very much lower recess pressures.

11. Under rated vertical load the horizontal clearance was absorbed by a lateral load equal to almost 15% of the vertical load.

12. The bearing's performance under lateral loading was found to be unaffected by rotation of the shaft.

13. Lateral loads applied impulsively did not affect conditions within the bearing any more than the same loads applied steadily.

14. Test Series 14 confirmed the findings of Test Series 10.

15. Once again, it was established that rotation of the shaft made no difference to the measured performance parameters.

16. Performance of the bearing was unaffected by the low frequency impulsive application of vertical loads.

17. The incorporation of air vessels in the piston cylinder heads was found to permit the shaft to rise from contact with the bottom half on start up without the necessity of bleeding the cylinders. Air vessels also allowed a marginally wider separation of extreme displacements under

impulsive vertical loading. They did, thereby, provide a cushioning effect. Changes of vessel volume, however, were found to make no measurable difference to the degree of cushioning over the volume size range investigated.

18. Measurements of shaft vibration velocity dB and frequency showed the bearing to be very smooth running.

19. A linear relationship was found to exist between values of torque applied to the support fulcrum of the bearing and angles of tilt between the bearing and shaft axes. The torque at which shaft/bearing contact would occur can thereby be predicted.

20. Exhaustive tests of the load/float/pressure/flow relationship of the modified bearing enabled the performance characteristics of the model bearing to be precisely defined both within, and also well above, its rated load range.

7.2 Bearing Performance - General

The findings of the individual tests, listed in 7.1 above, can be summarised by the following remarks:

7.2.1 Higher Top Manifold Pressure Setting

With an upper manifold pressure setting of 110 to 112 psig the unmodified bearing sustained a total vertical load of 7,700 lb (46% overload) at a shaft displacement of 0.001 inches; one half of the radial clearance.

7.2.2 Lower Top Manifold Pressure Setting

Decreasing the upper manifold pressure setting range (83 to 96 psig) diverted a higher flow to the bottom half and thus enabled the unmodified bearing to support a total vertical load of 8,700 lb (65% overload) at a shaft displacement of 0.001 inches; one half of the nominal radial clearance.

7.2.3 Modification to Increase Load-Supporting Area

The load-carrying characteristics of the bearing, illustrated in Figure 19, were found to be very much increased after modification. The modified bearing was found to be capable of supporting a total vertical shaft load of 10,490 lb (99% overload) with the nominal bottom radial clearance beneath the shaft (a displacement of 0.002 inches) with a bottom manifold pressure of 238.5 psig.

7.2.4 Shaft Rotation

Rotation of the shaft made no measureable difference to the performance of the bearing under any conditions of loading up to the rated speed of 553 rpm.

7.2.5 Fresh Water versus Sea Water

The different densities and viscosities of fresh water and sea water had no measurable effect on the bearing's performance.

7.2.6 Impulsive Loading

The bearing's performance under impulsively applied vertical loads up to 5 Hz and horizontal loads up to 4 Hz was not measurably different to its performance under steady loads of the same magnitude.

7.2.7 Coefficient of Friction

Coefficients of friction, which were intermediate in values between those typical of ball and roller bearings, did not change appreciably under any condition of loading.

7.2.8 Condition of the Bearing Surfaces after the Tests

There was only the slightest evidence of contact between the shaft and bearing surfaces. This would have occurred under the very high loads imposed when exploring the bearing's ultimate load-carrying capacity. Trace deposits of calcium salts were found on the bearing surfaces.

7.2.9 Effect of Air Vessels

The purpose of the air vessels is to allow the shaft to rise to assume a contact-free running position on start up. They were found to fulfil this function and also to permit a small cushioning movement of the shaft under impulsive loading. No attempt was made to optimise their size.

7.3 Characteristics of Bottom Half Orifices

7.3.1 Flow Division between Forward and After Recesses

Figures 3 and 4 are graphical presentations of tabulated orifice flow and pressure drop data. Whilst each figure presents the same graphs, the points of Figure 3 are coded to indicate shaft float and the points of Figure 4 indicate the number of the test series. Experimental points from Test Series 3, 4B, 6 and 7, (flow distribution 1) brought together on the same plot, give sets of fairly well defined curves.

The individual pressure drop/flow curves drawn in these figures do not represent the orifice characteristics. This is because the tabulated readings of pressure drop were measured at the forward recesses only whilst the flows are the combined flows to pairs of recesses. It cannot, in general, be assumed that the flows will divide equally between the recesses The entirely different forms of the pressure drop/flow curves for the port outer and starboard outer pairs of orifices indicate different divisions of flow in each case. This could be due to different shaft/bearing clearances opposite the recesses, resulting in different pressures within each recess and hence different pressure drops across the orifices. Also, the form of the curves of Figures 3 and 4 may well indicate that the orifices do not all have the same pressure drop/flow characteristic. If the shaft were aligned parallel to the bearing, the clearances opposite each orifice of a pair would be the same. Then, if all the orifices had like characteristics, equal splits of flow could be assumed and the orifice characteristic could be determined.

During testing is was observed that the shaft did not, in general, remain parallel with the bearing whilst floating up from it; one end would rise before the other. Tabulated values of float are thus the averages of readings taken at each end. It was, however, noted that at higher floats (and especially if the shaft was turning) the shaft tended to run in better alignment, reducing differences in clearance opposite each of the centre recesses. It is found, however, that even if equal divisions of flow to the centre recesses are assumed under these conditions, the tabulated data gives widely varying values of C, the orifice flow coefficient, in the expression:

$$P = C\,Q^2$$

where P and Q are pressure drop and flow, respectively. It is not possible to establish a consistent value for this parameter from the experimental data.

7.3.2 Unmodified Bearing - Test Series 4A, 8 and 9 - Orientation of the Shaft in the Bearing - Flow Distribution 2

Plotted points from Test Series 4A (circled on Figures 3 and 4) show that the shaft assumed a different orientation within the bearing during these tests. Comparison of Figures 5 and 6 shows that this different orientation was evidently adopted by the shaft during Test Series 8 and 9 as well, one in which the shaft was more centrally located. The reason for this second orientation is not understood and not enough points are available for analysis. No readings of recess pressure were taken during Test Series 8 and 9.

7.4 Modified Bearing - Recess Flows and Pressure Drops

Figures 7, 8 and 9 present the pressure drop/flow relationships across the orifices of the bearing for three typical applied loads after modification. The effect of this modification (in which the ends of the central escape annulus were sealed off) was to reduce the escape area from the recesses.

Figures 10, 11 and 12 present the percentage distribution of flow between the recesses under the same three applied loads. The flow distribution pattern is clearly defined and closely similar for each of the 10 applied loads in Test Series 20. A predominance of flow to the starboard outer (SO) recesses is seen to be a characteristic of the bearing after, as well as before, modification. There is no evidence of any alternative flow distribution after modification, such as was revealed by tests 4A, 8 and 9.

Referring to Figures 10, 11 and 12 it is seen that the shaft starts to move, at each load. at a total flow of about 4 igpm. At this condition some 40% of the flow passes through the SO recesses. Flows through the centre recesses, obstructed by the shaft, are the lowest of all. As it rises with increasing flows the part taken by the SO recesses increases (sometimes exceeding a half the total) and there is a corresponding decrease through the PO recesses. Having attained simultaneous maximum and minimum values in the outer recesses, there is a general improvement in flow distribution as the shaft moves toward centre. However, a markedly greater flow remains in the starboard recesses, the starboard outer recesses in particular. Flow distributions at initial shaft movement and at 2 thou float are almost the same in every case, being:

STARBOARD		CENTRE	PORT	
OUTER	INNER		INNER	OUTER
About 40%	Almost 20%	Almost 15%	About 15%	About 15%

This is illustrated by Figure 13. Starting with movement of the shaft at about 4 igpm for all loads, progressively higher flows are needed to sustain a float of 2 thou as applied loads are increased. The general form of the distributions, however, remains well defined and consistent throughout, indicating a similarity in the clearance gap flow pattern under all loads.

The distribution of recess flow is directly controlled by the radial clearance in way of each recess. Effectively, each recess lies between two orifices, the metering orifice upstream and a clearance gap downstream, the latter being an orifice of variable size. In this situation, with orifices in series, the one with the greatest pressure drop (operating on a steeper part of its square law curve) will be the one that regulates the flow. Since the pressure drop across the first orifice rarely exceeds that across the second by more than 10% (especially at the higher loads) it is the position of the shaft in the bearing that governs the individual recess flows.

7.4.1 Orientation of the Shaft in the Bearing - Outer Orifice Flow Distribution

Before deriving the orientation of the shaft from the outer recess flows the following assumptions are made:

(a) The percentage flow distribution being similar for all loads (see Figure 13), the flow paths from the outer recesses to atmosphere can be assumed to be the same at 2 thou float under each applied load.

(b) Most of the water from the outer recesses will flow circumferentially upwards across the horizontal escape lands. Having assumed, in (a) above, a similar flow pattern for each float at all loads, these restrictions can be considered as orifices through which, for a given pressure drop, rates of flow will be proportional to the gap thickness.

(c) The upper escape lands are about 15 degrees below the horizontal. The gap clearance can be taken equal to the horizontal radial clearance and, for lateral displacements of the shaft, the sum of the radial clearances to either side can be taken equal to 0.004 inches. (The radial clearance across these lands has been calculated to be 0.00184 ins at zero float.)

(d) Considering the outer recess escape gaps as orifices, the (mean) velocity of the water escaping from them will be proportional to the square root of the pressure drop, i.e. the square root of the recess pressure.

Expressions for the flows from the port and starboard outer recesses can then be written:

$$\frac{P_s}{P_p} = \frac{V_s^2}{V_p^2}$$

and $$\frac{P_s}{P_p} = \frac{Q_s^2}{Q_p^2} \cdot \frac{C_p^2}{C_s^2}$$

where P_s and P_p, Q_s and Q_p and C_s and C_p are the pressures, flows and clearances, respectively, starboard and port.

thus, $$\frac{C_p}{C_s} = \frac{Q_p}{Q_s}\sqrt{\frac{P_s}{P_p}}$$

An examination of the results of tests 20.3B, 20.6B and 20.9B shows that port and starboard outer recess pressures rarely differ by more than 6%. The ratio of their roots will lie, therefore, between 0.97 and 1.03 which, for the purpose of this analysis, can be taken as unity.

Knowing the outer recess flows, the lateral position of the shaft can be estimated using the simultaneous equations:

$$\frac{C_p}{C_s} = \frac{Q_p}{Q_s} \qquad \text{........(1)}$$

$$C_p + C_s = 4 \qquad \text{........(2)}$$

where C_p and C_s are the lateral clearances to port and starboard in thousandths of an inch.

7.4.2 Modified Bearing - Orientation of the Shaft at Two Thou Float

Taking the tabulated values of port and starboard outer recess flows and applying the equations derived in 7.4.1(d), we have the following estimates of the radial clearance of the shaft in way of the outer recesses for the three applied loads considered:

LOAD APPLIED	PORT OUTER RECESSES	STBD OUTER RECESSES	
3000 lb			
Flow	1.25	3.18	igpm
Clearance	1.13	2.87	thou
6000 lb			
Flow	1.71	4.12	igpm
Clearance	1.17	2.83	thou
9000 lb			
Flow	2.25	4.96	igpm
Clearance	1.25	2.75	thou

The clearances given above provide an indication of the orientation of the shaft towards the port side. These are average values. During the tests it was observed that the shaft tended to be skewed such that the after end clearance on the starboard side was greater than the forward starboard end with a consequent smaller clearance at the after port side.

7.4.3 Modified Bearing - Locus of the Shaft Axis

Figure 14, which traces the locus of the rising shaft axis under each of the three loads, was drawn by applying the flow/clearance relationship developed in 7.4.1 to the combined outer recess flows, port and starboard, taken from tables 20.3B, 20.6B and 20.9B. The shaft's permanent displacement to port is seen to increase initially and then decrease, based on the flows to the outer recesses. Shaft displacements below the arc of contact cannot, of course, exist and points below this line are taken to represent the average of floats at each end during an initial stage of rolling contact. During this stage the shaft may roll up the port side of the bearing at one end. It can therefore be assumed that the shaft is skewed in the horizontal plane with initial rolling contact along one edge of the bearing.

It is concluded that, during the initial displacement of the shaft to port, load is gradually transferred from metallic contact to hydrostatic support as the shaft rolls up the inclined surface of the bearing. This transfer is, perhaps, represented by the curved parts of the load/flow curves on Figure 19 and it is possible that their linear sections start from the point of entirely hydrostatic support. Metallic contact appears to be finally broken when the shaft has risen to an average float of a half a thou (for the loads considered) after which it tends to move away from the bearing surface towards the centre.

7.4.4 Influence of the Lateral Position of the Shaft on Total Flow through the Recesses

Under horizontal movements the clearance on one side of the shaft can be taken to increase by as much as it decreases on the other. The assumptions made in 7.4.1 imply that the sum of the flows from the outer recesses will remain unaltered during lateral movements of the shaft. If this assumption were to be extended to the inner recesses the implication would be that the total flow through all the bottom recesses remains essentially unaltered during horizontal shaft displacements.

The validity of this assumption is given weight by the fact that the load/flow/pressure/float relationships constituting the operating characterictics of the bearing (derived in section 7.7) are remarkably regular (from floats of 1 to 2 thou) and give no indication of significant internal flow differences.

7.5 Modified Bearing - Factors Affecting the Lateral Position of the Shaft as it Rises in the Bearing

After initial rolling contact on the port side of the bearing the shaft retains a constant displacement to port. Its attitude is a combination of clockwise angular and port lateral misalignment. Forces responsible for this misalignment may be either hydraulic or mechanical and could be due to:

(a) Inequality of hydraulic loading among the four shoes.

(b) Hydraulic thrusts due to differences in the outer (and inner) bottom recess pressures.

(c) Mechanical forces due to contact with the bearing which, constrained in its pivoting mounting bracket, has no freedom to swivel in the horizontal plane and assume a position of angular alignment with the shaft.

(d) Mechanical loads imposed by the test rig, possibly due to horizontal components of an applied load, the line of action of which departs slightly from the vertical.

7.5.1 Lateral Thrusts due to Hydraulic Pressures

The forces on the graphs of figures 15, 16 and 17 were plotted by summing the tabulated shoe recess and bottom outer forward recess pressures to port and starboard and were based on the horizontal projections of the recess areas. These, which were considered as rectangles, are:

ON EACH SIDE		AREA	ANGLE	PROJECTED AREA
		sq.in	degrees	sq.in
TOP HALF	Two recesses in each shoe	5.25	45	3.172
BOTTOM HALF	Two outer Recesses	6.5625	30	5.683

The pattern of the horizontal hydraulic forces at each load is seen to be remarkably consistent. The resultant horizontal force of the four top bearing shoes is towards the starboard side at zero float. Also the lower bearing outer recess pressure differences result in a small force to starboard at zero float. The top bearing shoe horizontal force decreases steadily with increasing float, changing sign to finally become a thrust of greater magnitude to port, while the horizontal thrust from the lower bearing increases steadily in the starboard direction. However, it is seen that the plot of the resultant of these two thrusts, which are of opposite slope, gives a curve of practically the same shape for each of the three loads considered. The resultant hydraulic thrust reaches a maximum of about 40 lb to starboard and then decreases as the shaft rises, becoming almost zero at 2 thou float.

7.5.2 Lateral Thrust due to Shoe Pressures
- Effect of Starboard After Shoe

The reason for the change of sign of the shoe recess thrust as the shaft rises is explained by reference to Figure 18 in which individual shoe recess pressures are plotted against average float for the 6000 lb load condition. Three of the four shoes give similar curves with comparable pressure values in which it is seen that recess pressures increase first rapidly, up to a float of about a half a thou, and then less rapidly up to two thou float. This change in the rate of pressure increase with float is explained by an upward movement of the three pistons which seems to start at recess pressures of about 35 psig. This movement maintains the clearance gaps and flows as the shaft rises, thus limiting the pressure increases in the recesses. It is concluded, from this graph, that the starboard after piston, unlike the others, is not free to move. Up to a float of one thou its shoe presents a wider clearance gap than the others, since the pressure in its recesses is lower. Above one thou float its clearance gap is less than the others (which have moved up with the shaft) and its recess pressure is therefore higher. A net thrust to starboard is thus created below one thou float and a net thrust to port above it, for the load considered. The general form of these curves is the same for every applied load and this anomaly in the operation of the starboard after shoe is present in all the tests conducted on the modified bearing. It is reasonable to suppose that, if the starboard outer shoe was free to move, its curve would lie together with the others. The resultant lateral thrust due to shoe pressure would then be nil or very small. It is a clear and a significant fact that the shoes would then exert no net lateral restoring force on the shaft.

	INNER AND OUTER RECESS PRESSURES				INNER AND OUTER RECESS FLOWS			
AVERAGE FLOAT	PORT FOR'D	PORT AFTER	STBD FOR'D	STBD AFTER	PORT FOR'D	PORT AFTER	STBD FOR'D	STBD AFTER
thou	psig	psig	psig	psig	igpm	igpm	igpm	igpm
2.09	44.2	46.4	45.8	57.6	1.29	1.33	1.48	0.98
1.75	42.8	45.3	44.6	55.0	1.32	1.36	1.50	1.04
1.53	41.9	45.0	43.7	51.2	1.33	1.36	1.50	1.08
1.14	40.6	44.1	42.3	44.7	1.35	1.38	1.53	1.15
1.03	40.0	43.8	41.8	42.8	1.35	1.38	1.53	1.17
0.74	39.4	41.2	40.8	36.9	1.37	1.41	1.55	1.24
0.60	38.7	39.6	40.2	34.0	1.38	1.44	1.56	1.29
0.42	37.2	37.0	38.6	30.2	1.39	1.47	1.59	1.33
0.33	36.6	36.0	38.0	28.0	1.40	1.49	1.58	1.36
0.25	34.9	34.0	36.0	26.8	1.40	1.50	1.60	1.40
0.14	29.4	30.5	29.5	23.7	1.40	1.50	1.60	1.35
0.10	26.6	29.1	26.2	22.4	1.40	1.50	1.65	1.34
0.07	24.3	27.6	23.5	20.9	1.38	1.45	1.61	1.30

Shoe pressure and flow data from Table 20.6B (6000 lb load) is reproduced above. It is seen that flow to the starboard after shoe is always lower than flow to the others and that it becomes progressively more restricted at higher floats, resulting in the higher recess pressures as the shaft is raised.

7.5.3 Lateral Thrusts due to Mechanical Forces

It is significant that the shaft, constantly displaced to port, experiences a resultant hydraulic thrust that is always to starboard at floats less than two thou. How, then, can its displacement to port be explained? The only explanation to be offered is that the shaft experiences a mechanical force to port.

In the test rig the shaft is loaded by a strongback (see Appendix E, Figure 1) with a load-applying rod at one end and a turnbuckle at the other. The turnbuckle and rod are pin-jointed to the ends of the strongback. The lower end of the turnbuckle is pin-jointed to a bracket bolted to the base frame and the lower end of the load-applying link is pin-jointed to the load-magnifying mechanism. It can be assumed that the pin joints permit the links complete freedom to pivot, in which case the lines of action of the loads applied to the strongback will pass through the centres of the pins. The condition for the resultant of these applied loads to be transmitted as a vertical load to the shaft is that the centres of the pins in the links at each end of the strongback be in vertical planes.

In setting up the test rig, the best that can be done to ensure that the links are vertical is to adjust the positions of the two pivot brackets on the bed frame until the turnbuckle and load-applying rod are vertical by spirit level. The bearing housing, however, is free to move laterally about 50 thou on its trunnion bearing; this freedom is, in fact, provided so that the bearing may align itself with the shaft (see 3.1, second paragraph). Lateral movement of the bearing under test is therefore possible; when it occurs, the turnbuckle, load-applying rod and the line of action of the applied load will all depart from the vertical. With a turnbuckle 15 inches long, a lateral movement of 50 thou will produce an inclination of 0.2 degrees. This, under an applied load of 6000 lb, will produce a lateral component of 20 lb. In addition, if angular misalignment is present the bearing will, under conditions of mechanical contact, exert a lateral component of the applied load.

7.6. Modified Bearing

Magnitude of the Lateral Mechanical Load

Analysis of the data obtained during Test Series 20 is complicated by a malfunction in the working of the starboard after shoe. Because of this, the shoe recess pressures exert a resultant lateral force on the shaft which changes direction of action as the shaft rises (Figures 15, 16 and 17). Figure 18, however, indicates that the recess pressures in the other three shoes remain much the same as the shaft floats up, despite its large displacement to port, and that if the starboard after shoe had been free to move its curve would have lain together with the others. If all the shoes are working in a similar manner it is, therefore, concluded that they will exert no resultant restoring force on the shaft under lateral displacements.

If it is assumed that, with correctly functioning shoes, only the outer load-bearing recesses will exert a restoring force on the shaft, it is possible to estimate the magnitude of the lateral mechanical load.

Referring to the graphs of Figures 15, 16 and 17, magnitudes of outer recess thrust can be read off for floats at which the shoe recess thrust was zero. At these floats only the outer recess thrust opposes the mechanical load, whose magnitude will be equal and opposite to it. The shaft's lateral displacements corresponding to these floats can be read from Figure 14:

LOAD	AVERAGE FLOAT	DISPLACEMENT	LATERAL MECHANICAL LOAD
lb	thou	thou	lb
3000	1.25	1.10 to Port	21
6000	1.00	1.25 to Port	31
9000	0.55	1.35 to Port	35

7.7 Modified Bearing - Performance Characteristics

The load/float/pressure/flow relationships of the modified bearing were exhaustively investigated in the final series of tests, Test Series 20. The data accumulated during those tests in which manifold pressures were progressively increased (Tests 20.1B, 20.2B, 20.3B etc.) were used in the study of the bearing's characteristics.

The modified bearing's characteristics are presented in Figure 19, which is a graphical presentation of data from Tests 20.1B, 20.2B, 20.4B, 20.6B and 20.8B. This is analogous to the graph of Figure 1, with which it can be compared. Figure 1 shows the same parameters for the original (unmodified) bearing without the pistons and without orifices in the supply ports to the recesses.

In comparing these two graphs it should be remembered that the shaft loads of Figure 1 are the externally applied loads exerted through the shaft on the bottom half bearing whereas, in Figure 19, the loads due to the pistons have been added to the plotted values of applied load to give the total loads on the bottom half. With the shaft concentric (a float of 2 thou) the piston loads vary from about 45% of the applied load at 1000 lb to about 17% of the applied load at 8000 lb.

7.7.1 Performance Evaluation

An interesting feature of the bearing is that, when flow to the bottom half is opened up and pressure slowly increased, the shaft makes its initial movement at almost the same flow rate for all values of load. As the flow increases beyond 3.6 igpm a sudden and steep pressure resistance is encountered and, by 4 igpm, movement of the shaft has started for all loads up to the highest applied load of 9000 lb. For all five loads plotted on the graph, the envelope of the pressure/flow curves representing this initial movement is an almost vertical line to which a good fit is given by the equation:

$$P = (2 \times 10^{-16})\ Q^{30}$$

where P and Q are pressure and flow respectively in the units of the graph.

After the sudden pressure rise with the initial movement of the shaft the almost vertical curve fans out into a family of curves, each at a pressure level corresponding to the load. At each branch the pressure/flow relationship (for both manifold and recess pressure) rounds off and becomes linear. It is possible that the curved parts represent the transition from mechanical to hydraulic support and that loss of contact coincides with the beginning of their linear sections. At each value of applied load linearity starts at a float of about 1 thou and is maintained up to a float of 2 thou.

Regression analysis of the test readings gives the following equations for the linear parts of the manifold pressure and average recess pressure curves:

Constant applied load: 8000 lb		S.D.
Manifold:	$P = 180.9 + 3.03\ Q$	0.873
Average Recess:	$P = 183.1 + 1.47\ Q$	0.253

Constant applied load: 6000 lb		S.D.
Manifold:	$P = 159.4 + 2.11 Q$	0.766
Average Recess:	$P = 150.9 + 1.68 Q$	0.173

Constant applied load: 4000 lb		S.D.
Manifold:	$P = 123.9 + 2.63 Q$	0.190
Average Recess:	$P = 119.4 + 1.80 Q$	0.063

Constant applied load: 2000 lb		S.D.
Manifold:	$P = 80.7 + 3.00 Q$	0.228
Average Recess:	$P = 78.1 + 2.04 Q$	0.370

Constant applied load: 1000 lb		S.D.
Manifold:	$P = 47.8 + 4.17 Q$	0.370
Average Recess:	$P = 44.3 + 3.32 Q$	0.195

Standard Deviations (SD) are in units of psi. Their low values for average recess pressures show that the points approximate closely to straight lines between the 1 and 2 thou float points. The points for manifold pressures are not so closely packed about their regression lines. For this reason the analysis is based on averaged recess pressures.

The locations of the 1, 1.5 and 2 thou float points on the recess pressure lines were obtained by regression analysis of the flow/float relationship at each load. This relationship was thereby assumed to be linear under constant load within this range, an assumption that was generally confirmed by the curves of average float readings against bottom recess flow that were prepared during the analysis. Regression lines were drawn through the float/flow coordinates and flow values corresponding to floats of 1, 1.5 and 2 thou were obtained. The equations of the regression lines and the coordinates of the points given by them are shown below. F is the float in thou and Q is the flow to the bottom recesses in igpm.

Constant applied load: 8000 lb I.D.

$F = 0.180\ Q - 0.018$ 0.581

At $F = 1$, $Q = 5.66$

At $F = 1.5$, $Q = 8.45$

At $F = 2$, $Q = 11.23$

Constant applied load: 6000 lb I.D.

$F = 0.212\ Q - 0.172$ 0.971

At $F = 1$, $Q = 5.53$

At $F = 1.5$, $Q = 7.89$

At $F = 2$, $Q = 10.25$

Constant applied load: 4000 lb I.D.

$F = 0.238\ Q - 0.298$ 0.950

At $F = 1$, $Q = 5.46$

At $F = 1.5$, $Q = 7.56$

At $F = 2$, $Q = 9.66$

Constant applied load: 2000 lb I.D.

$F = 0.298\ Q - 0.246$ 0.832

At $F = 1$, $Q = 4.18$

At $F = 1.5$, $Q = 5.85$

At $F = 2$, $Q = 7.53$

Constant applied load: 1000 lb I.D.

$F = 0.438\ Q - 0.763$ 0.738

At $F = 1$, $Q = 4.02$

At $F = 1.5$, $Q = 5.16$

At $F = 2$, $Q = 6.30$

The above Indices of Determination (I.D.) show that (except at the 8000 lb load) the points deviate less from their regression line as values of applied load increase. The above values of F were plotted on the load lines of Figure 3 against the corresponding values of Q. Curves of constant float were then traced, as closely as possible, through them all. Since, at constant float, the bearing constitutes a fixed restriction to flow, these curves, in terms of P and Q, can be expected to follow the square law.

fact, found to align themselves closely to the quadratic equations given below and curves corresponding to these equations were finally plotted on Figure 3. Flow values at the intercepts of these curves with the constant load lines are given for comparison with the flows obtained by regression analysis of the float/flow relationships. The approximation is seen to be almost exact for the 2 thou float curve and good for the 1.5 thou curve. The approximation is not so good for the 1 thou float curve which does not extend down through the straight parts of the 2000 and 1000 lb lines.

2.0 THOU FLOAT CURVE: $P = 1.6\ Q^2$

Intercepts with constant load lines:

Load	8000	6000	4000	2000	1000	lb
Square law	11.15	10.23	9.22	7.64	6.34	igpm
Regression analysis	11.23	10.25	9.66	7.53	6.30	igpm
Difference	-0.7%	-0.2%	-4.6%	+1.5%	+0.6%	

1.5 THOU FLOAT CURVE: $P = 2.5\ Q^2$

Intercepts with constant load lines:

Load	8000	6000	4000	2000	1000	lb
Square law	8.84	8.09	7.28	6.00	4.92	igpm
Regression analysis	8.45	7.89	7.56	5.85	5.16	igpm
Difference	+5%	+6%	+3%	+3%	-5%	

1.0 THOU FLOAT CURVE: $P = 4.7\ Q^2$

Intercepts with constant load lines:

Load	8000	6000	4000	lb
Square law	6.39	5.84	5.12	igpm
Regression analysis	5.66	5.53	5.46	igpm
Difference	+13%	+6%	-6%	

7.7.2 Performance Definition

The load/float/pressure/flow characteristics that define the operating conditions of the modified model 6.5 inch diameter hydrostatic bearing, as measured under test and refined by analysis, are thus represented by the following curves:

(a) Lift-off Curve: $P = (2 \times 10^{-16})\ Q^{30}$

(b) Constant Load Curves (at floats between 1 and 2 thou):

At 8000 lb: $P = 183.1 + 1.47\ Q$

At 6000 lb: $P = 150.9 + 1.68\ Q$

At 4000 lb: $P = 119.4 + 1.80\ Q$

At 2000 lb: $P = 78.1 + 2.04\ Q$

At 1000 lb: $P = 44.3 + 3.32\ Q$

The following general equation is recommended for the purpose of plotting load curves. It is particularly accurate for loads between 2000 lb and 6000 lb.

$$P = 0.8198\ L^{x} + (7.815/L^{y})\ Q$$

L is the applied load in lb, $x = 0.5995$ and $y = 0.1767$

(c) Constant Float Curves:

At 2.0 thou: $P = 1.6\ Q^{2}$
At 1.5 thou: $P = 2.5\ Q^{2}$
At 1.0 thou: $P = 4.7\ Q^{2}$

where P is the average of the pressures in the centre and outer recesses (psig) and Q is the flow to the bottom recesses (igpm).

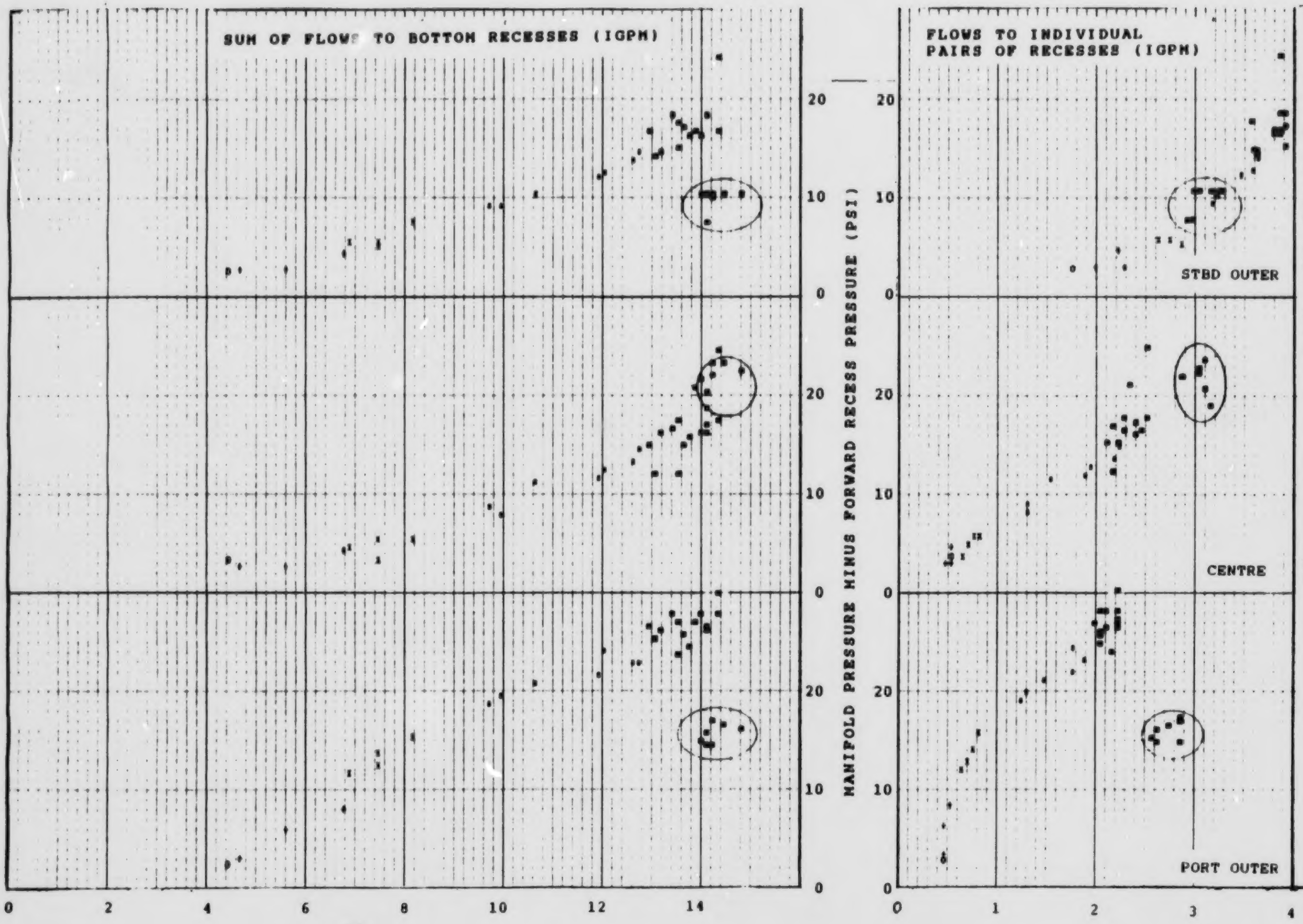


FIGURE 3.

TEST SERIES
3, 4, 6, 7.

UNMODIFIED BEARING

ORIFICE PRESSURE DROP
VERSUS RECESS FLOW
FOR INCREASING FLOWS
Plot coded by shaft float

NOTE
Pressures in forward recesses.
Flows to pairs of recesses.

KEY
SHAFT FLOAT (thou)
■ ⩾ 2.0
▮ ⩾ 1.5, < 2.0
x ⩾ 1.0, < 1.5
+ ⩾ 0, < 1.0
o = 0

TESTS 4A

With the exception of Tests 4A pressure drops relate to flows under Distribution 1.

K&E 10 X 10 TO THE INCH
KEUFFEL & ESSER CO

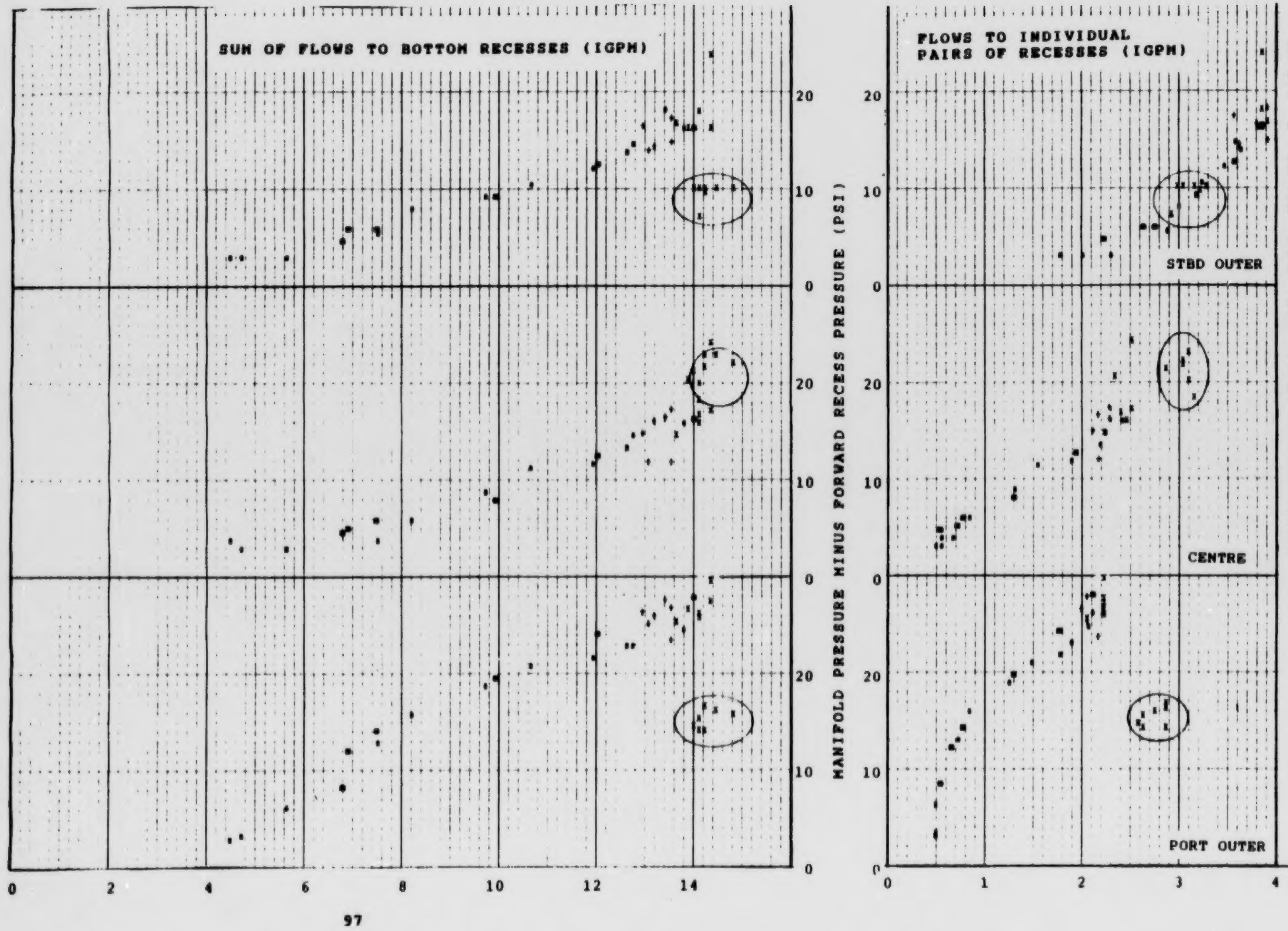


FIGURE 4.

TEST SERIES
3, 4, 6, 7.

UNMODIFIED BEARING

ORIFICE PRESSURE DROP
VERSUS RECESS FLOW
FOR INCREASING FLOWS
Plot coded by test series

NOTE
Pressures in forward recesses.
Flows to pairs of recesses.

KEY
TEST SERIES
- + Series 3
- x Series 4
- ▪ Series 6
- ■ Series 7

TESTS 4A

With the exception of Tests 4A pressure drops relate to flows under Distribution 1.

10 X 10 TO THE INCH
KEUFFEL & ESSER CO.

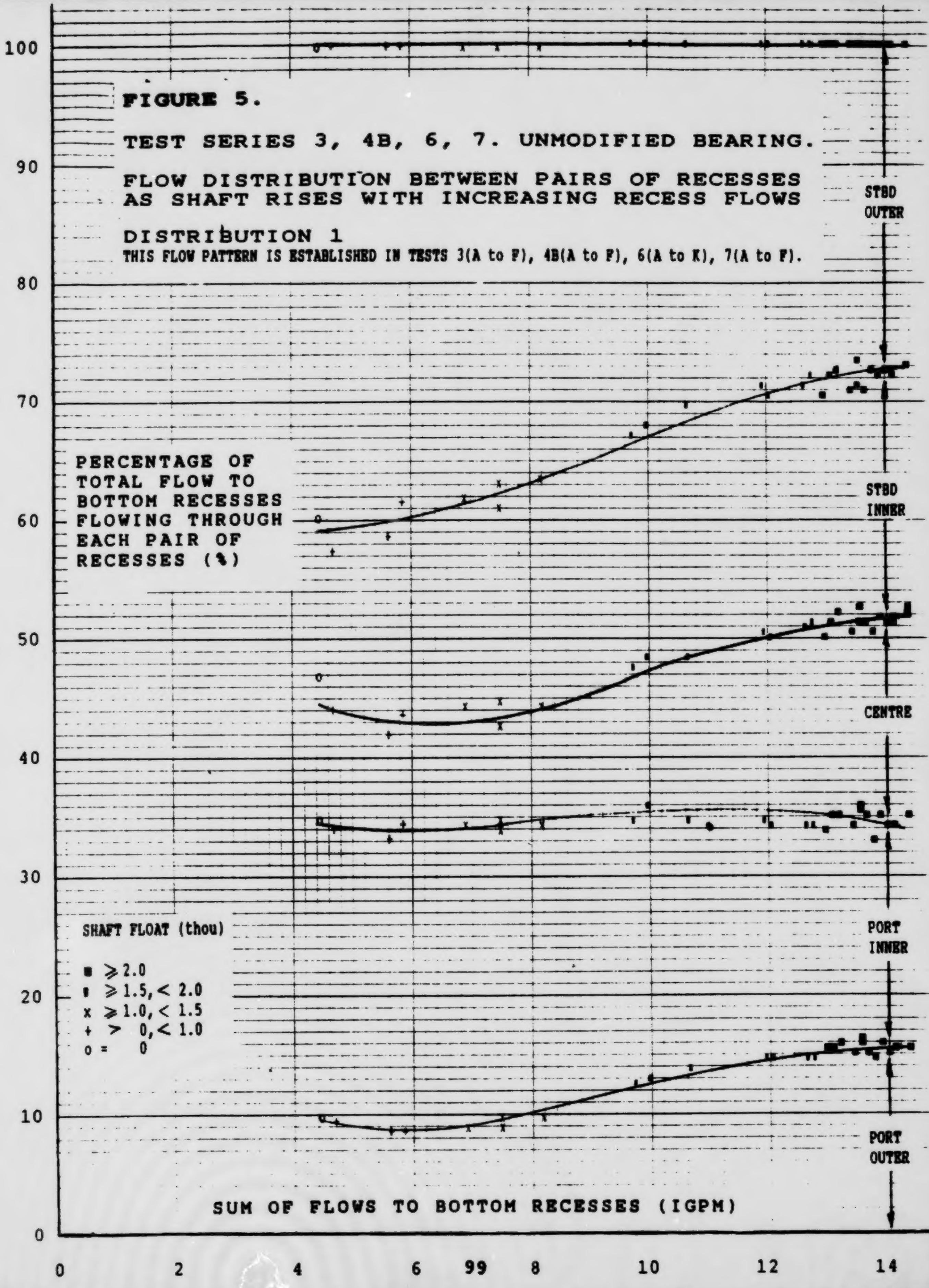


FIGURE 5.

TEST SERIES 3, 4B, 6, 7. UNMODIFIED BEARING.

FLOW DISTRIBUTION BETWEEN PAIRS OF RECESSES AS SHAFT RISES WITH INCREASING RECESS FLOWS

DISTRIBUTION 1

THIS FLOW PATTERN IS ESTABLISHED IN TESTS 3(A to F), 4B(A to F), 6(A to K), 7(A to F).

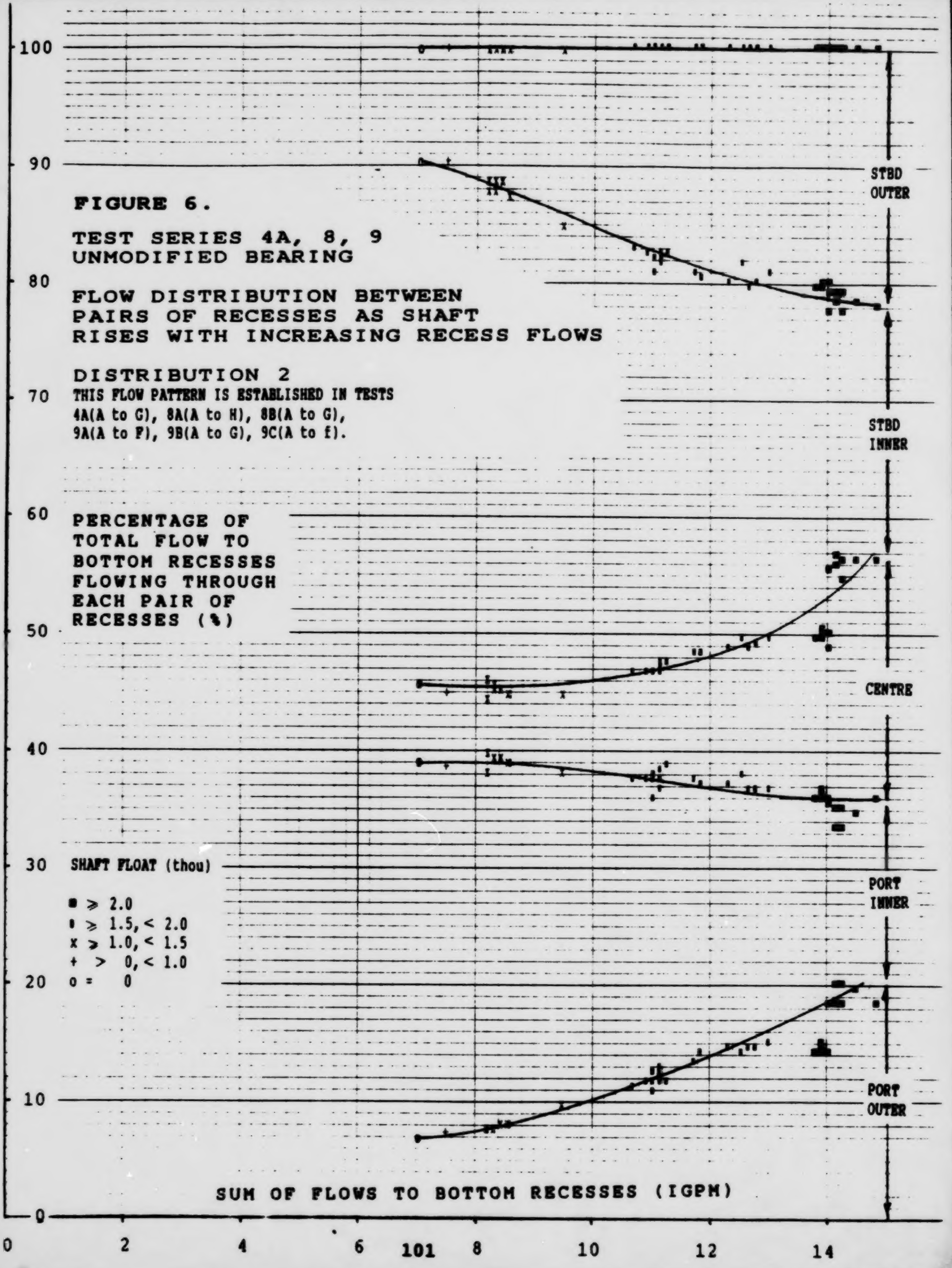


FIGURE 6.

TEST SERIES 4A, 8, 9
UNMODIFIED BEARING

FLOW DISTRIBUTION BETWEEN PAIRS OF RECESSES AS SHAFT RISES WITH INCREASING RECESS FLOWS

DISTRIBUTION 2

THIS FLOW PATTERN IS ESTABLISHED IN TESTS 4A(A to G), 8A(A to H), 8B(A to G), 9A(A to F), 9B(A to G), 9C(A to f).

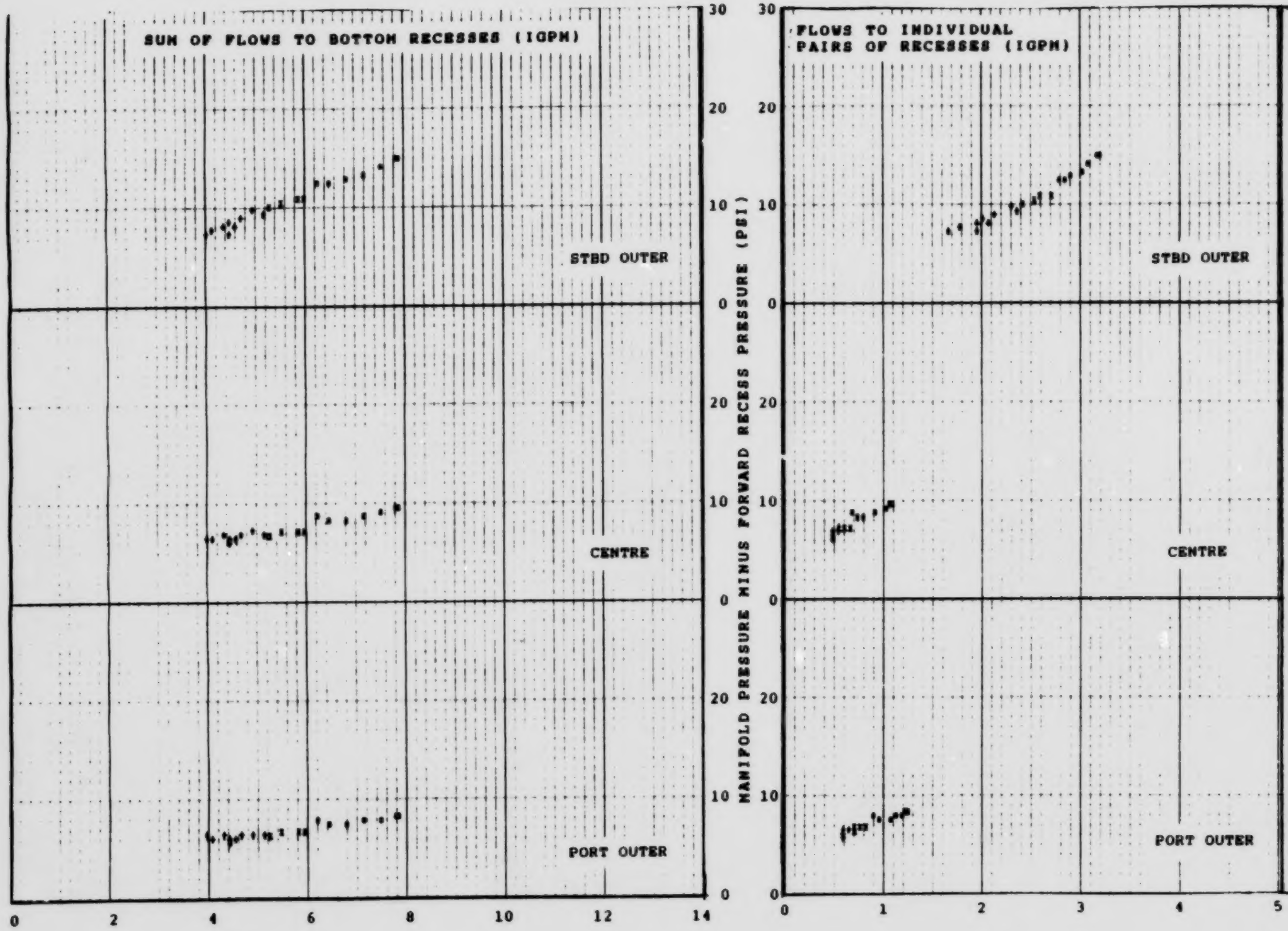


FIGURE 7.

TEST SERIES 20.3B

**MODIFIED BEARING
UNDER 3000 lb
APPLIED LOAD**

**ORIFICE PRESSURE DROP
VERSUS RECESS FLOW
FOR INCREASING FLOWS**

NOTE
Pressures in forward recesses.
Flows to pairs of recesses.

KEY
SHAFT FLOAT (thou)
● ≥ 2.0
• ≥ 1.5, < 2.0
x ≥ 1.0, < 1.5
• > 0, < 1.0
o = 0

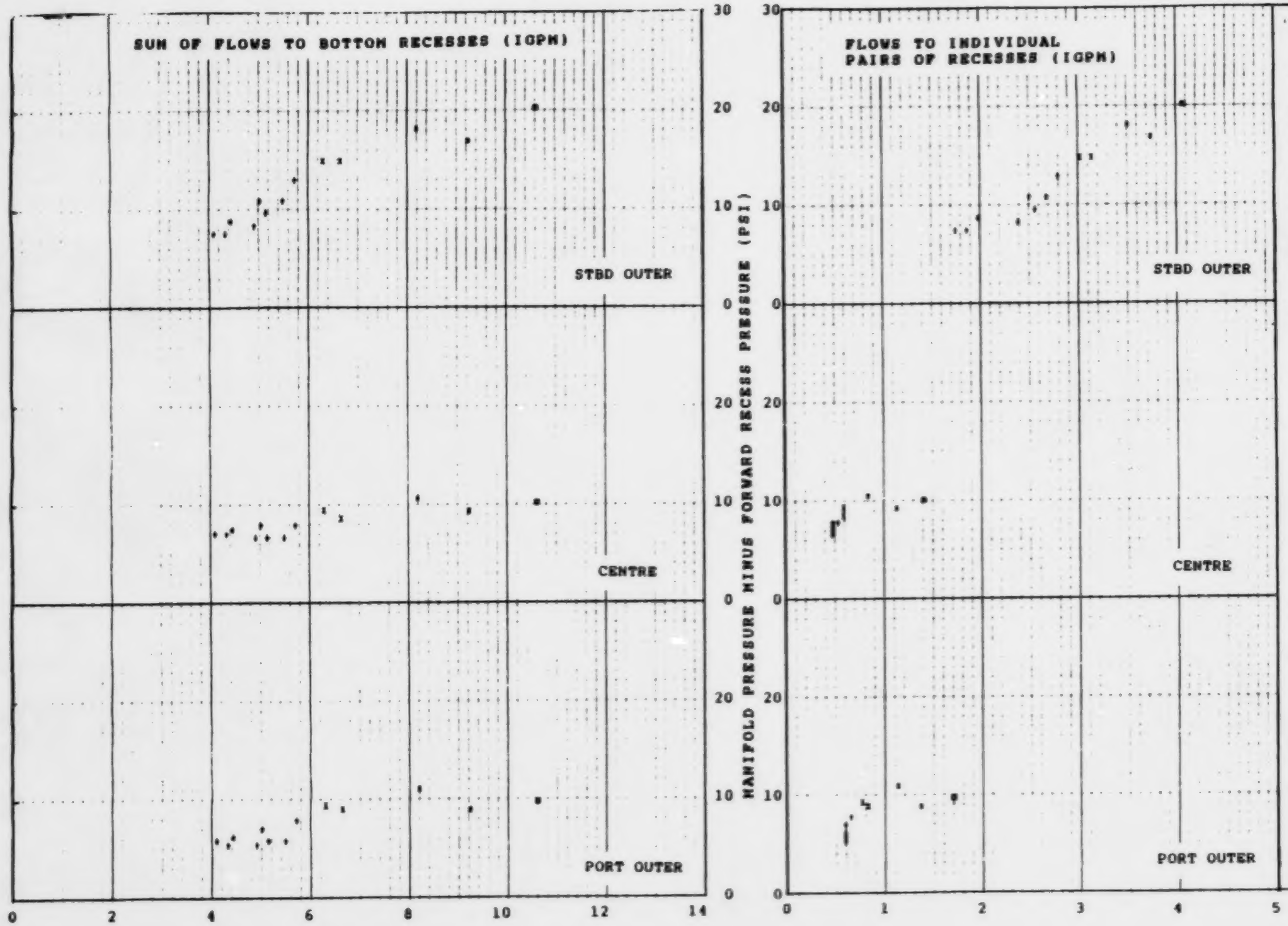


FIGURE 8.

TEST SERIES 20.6B

MODIFIED BEARING UNDER 6000 lb APPLIED LOAD

ORIFICE PRESSURE DROP VERSUS RECESS FLOW FOR INCREASING FLOWS

NOTE
Pressures in forward recesses.
Flows to pairs of recesses.

KEY
SHAFT FLOAT (thou)
■ ≥ 2.0
⁞ ≥ 1.5, < 2.0
x ≥ 1.0, < 1.5
+ > 0, < 1.0
o = 0

10 X 10 TO THE INCH KEUFFEL & ESSER CO.

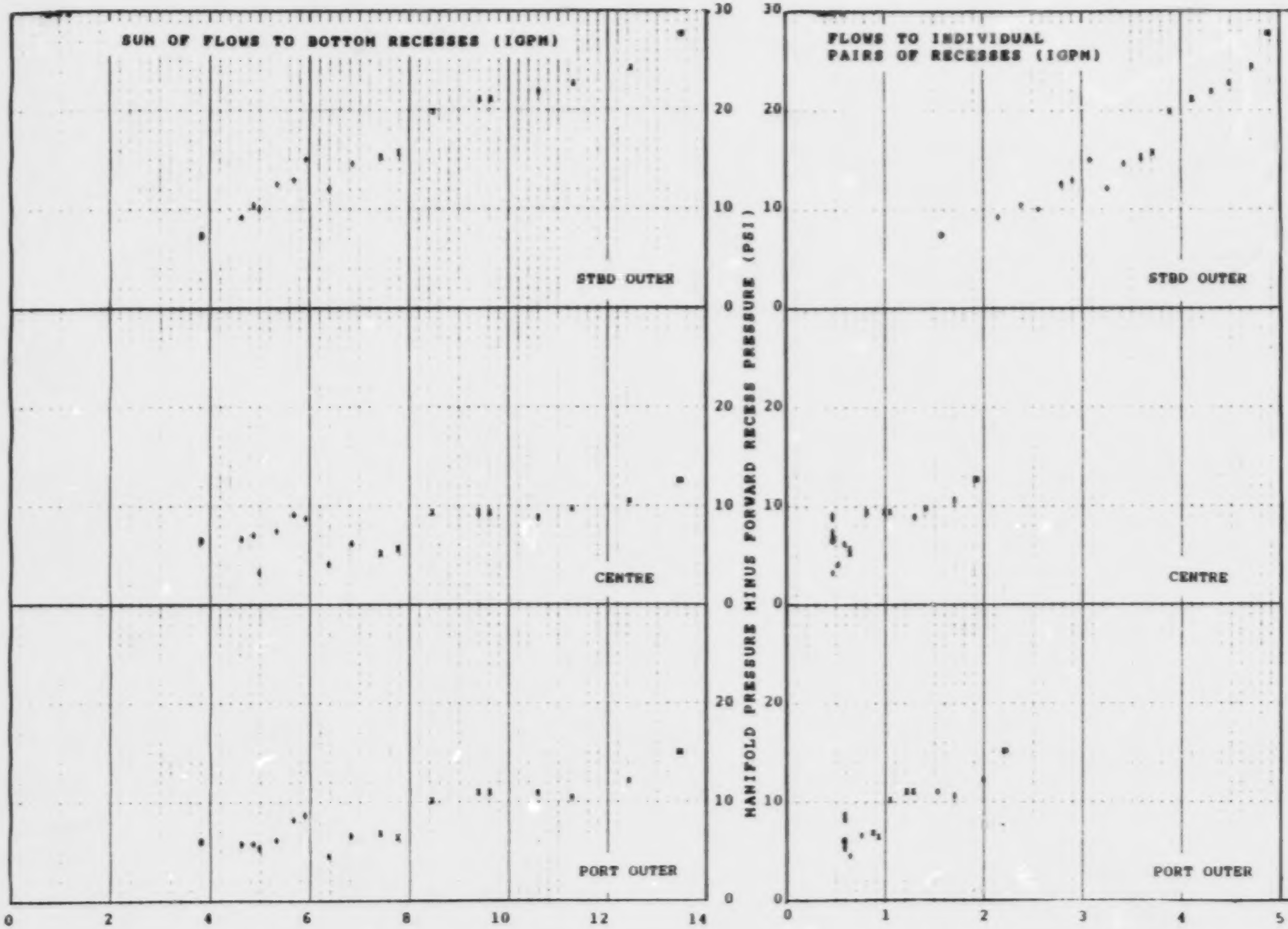


FIGURE 9.

TEST SERIES 20.9B

**MODIFIED BEARING
UNDER 9000 lb
APPLIED LOAD**

**ORIFICE PRESSURE DROP
VERSUS RECESS FLOW
FOR INCREASING FLOWS**

NOTE
Pressures in forward recesses.
Flows to pairs of recesses.

KEY
SHAFT FLOAT (thou)
■ ≥ 2.0
≥ 1.5, < 2.0
x ≥ 1.0, < 1.5
+ > 0, < 1.0
o = 0

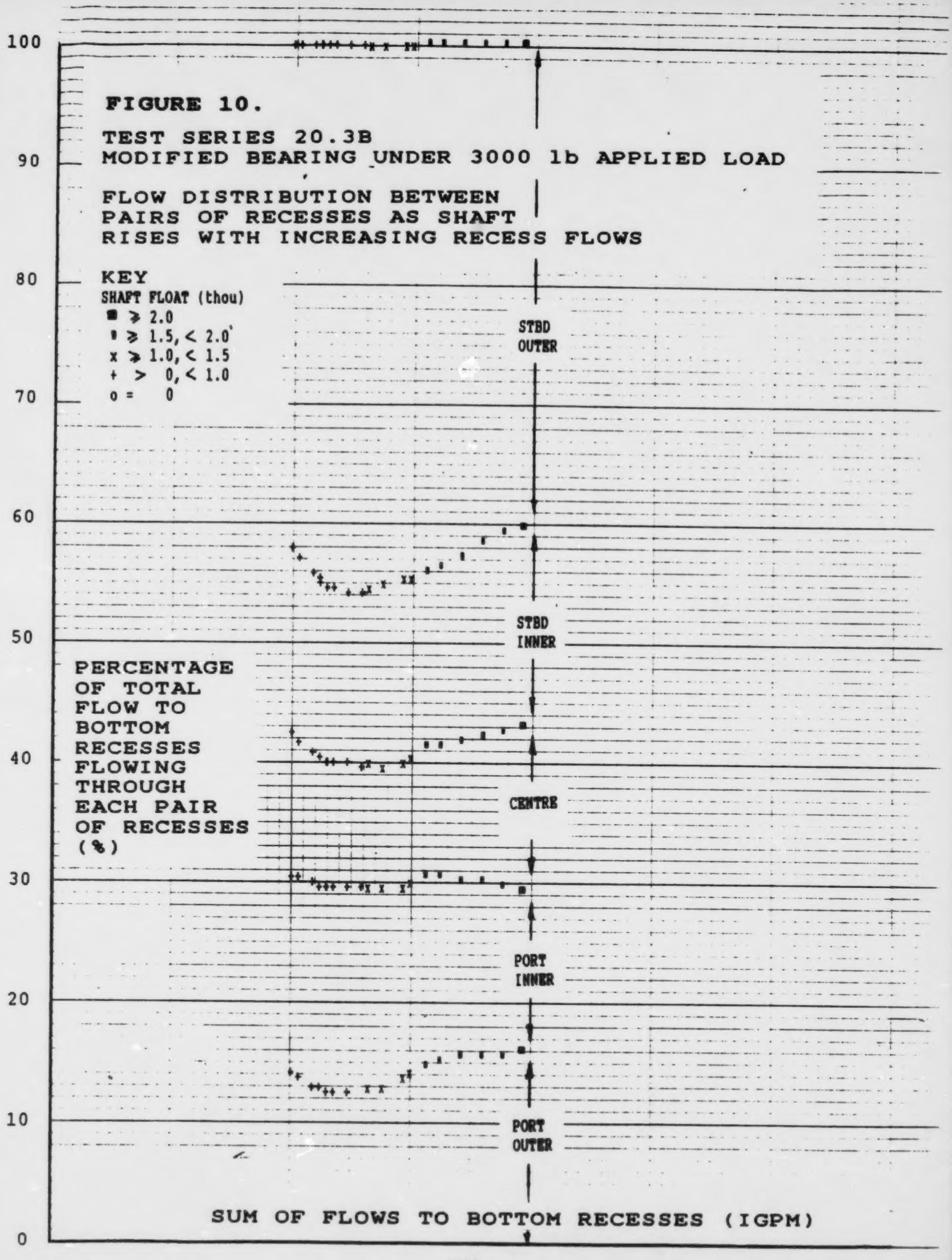


FIGURE 10.

TEST SERIES 20.3B
MODIFIED BEARING UNDER 3000 lb APPLIED LOAD

FLOW DISTRIBUTION BETWEEN PAIRS OF RECESSES AS SHAFT RISES WITH INCREASING RECESS FLOWS

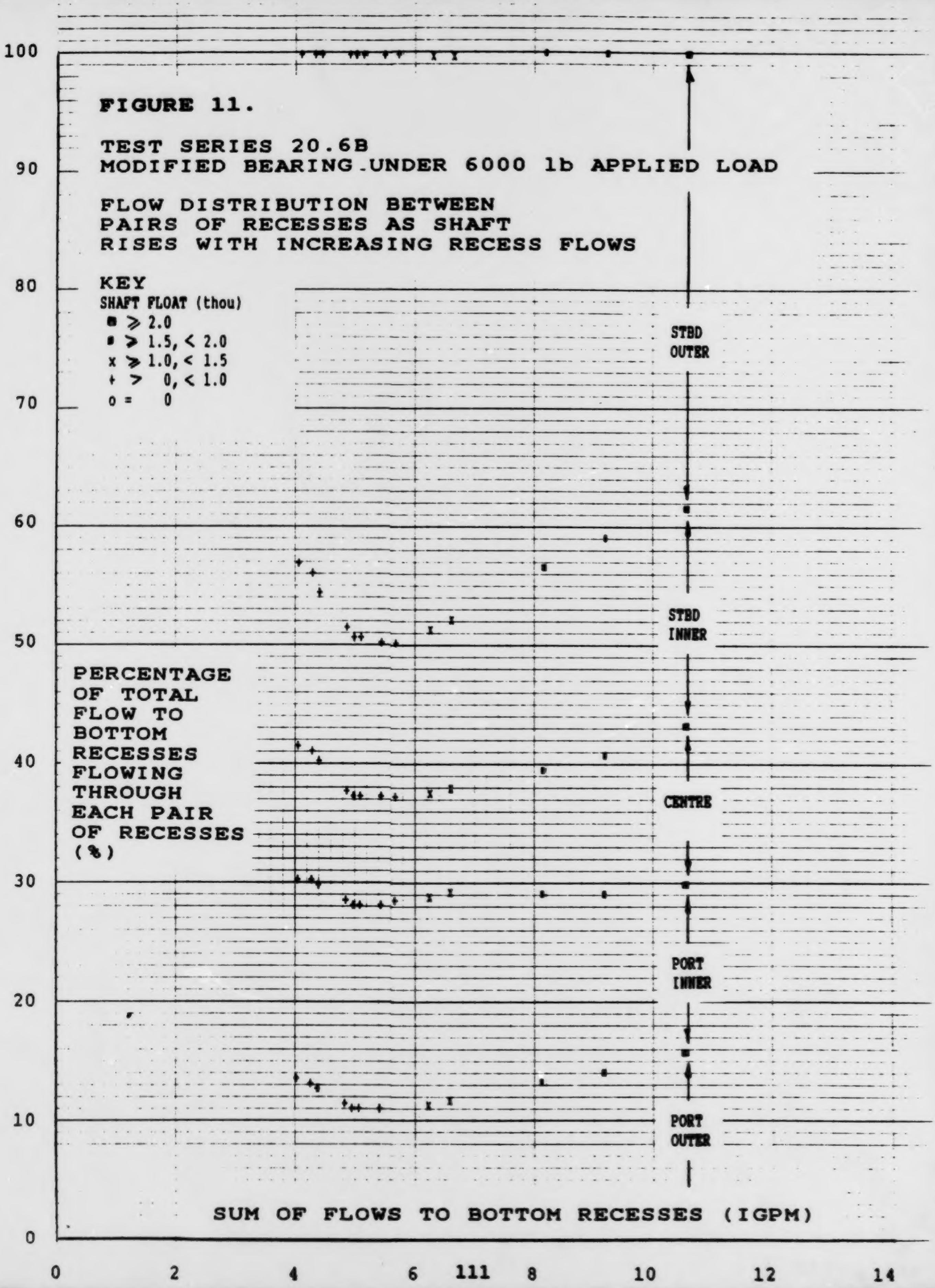


FIGURE 11.

TEST SERIES 20.6B
MODIFIED BEARING UNDER 6000 lb APPLIED LOAD

FLOW DISTRIBUTION BETWEEN PAIRS OF RECESSES AS SHAFT RISES WITH INCREASING RECESS FLOWS

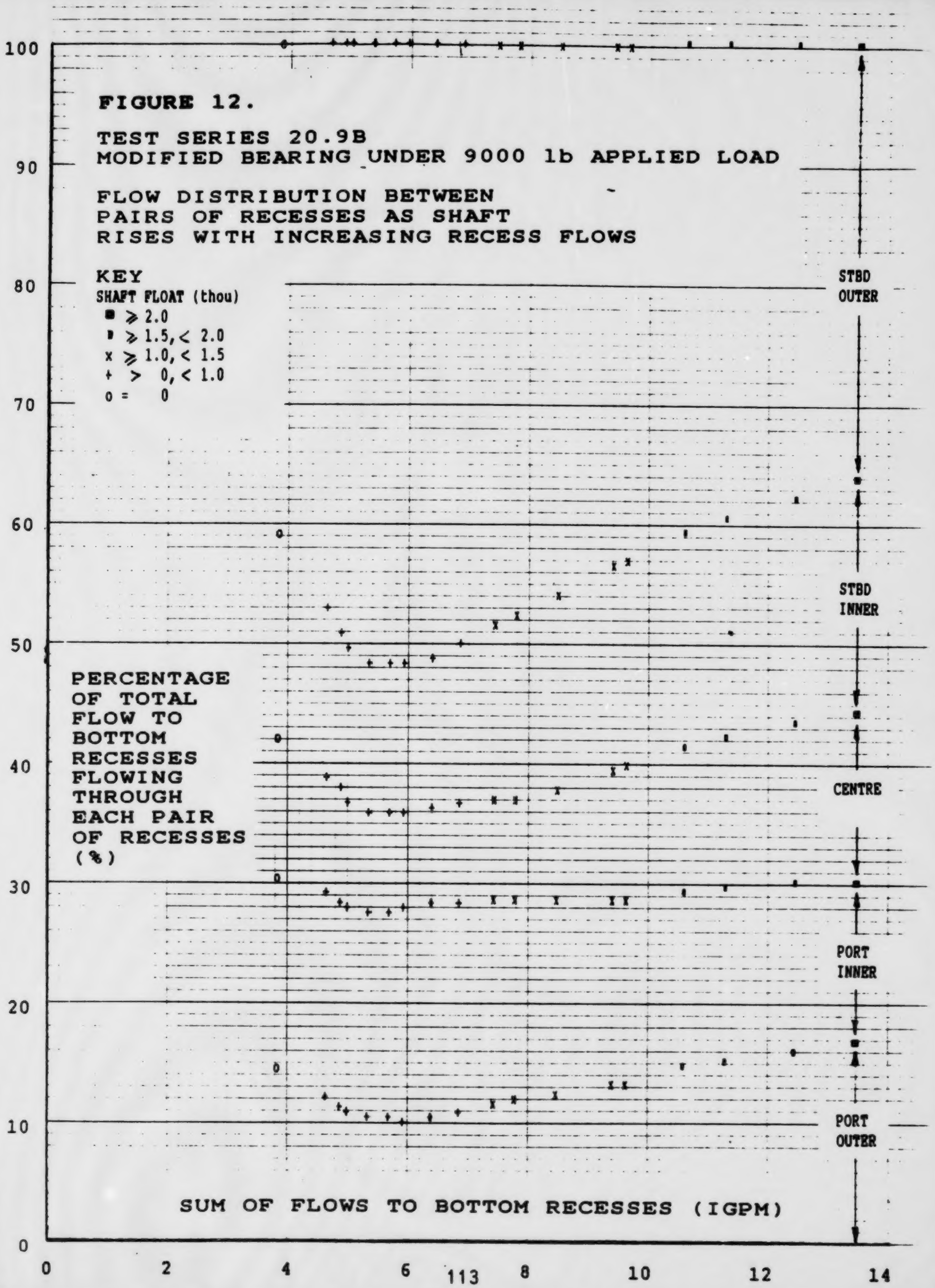


FIGURE 12.

TEST SERIES 20.9B
MODIFIED BEARING UNDER 9000 lb APPLIED LOAD

FLOW DISTRIBUTION BETWEEN PAIRS OF RECESSES AS SHAFT RISES WITH INCREASING RECESS FLOWS

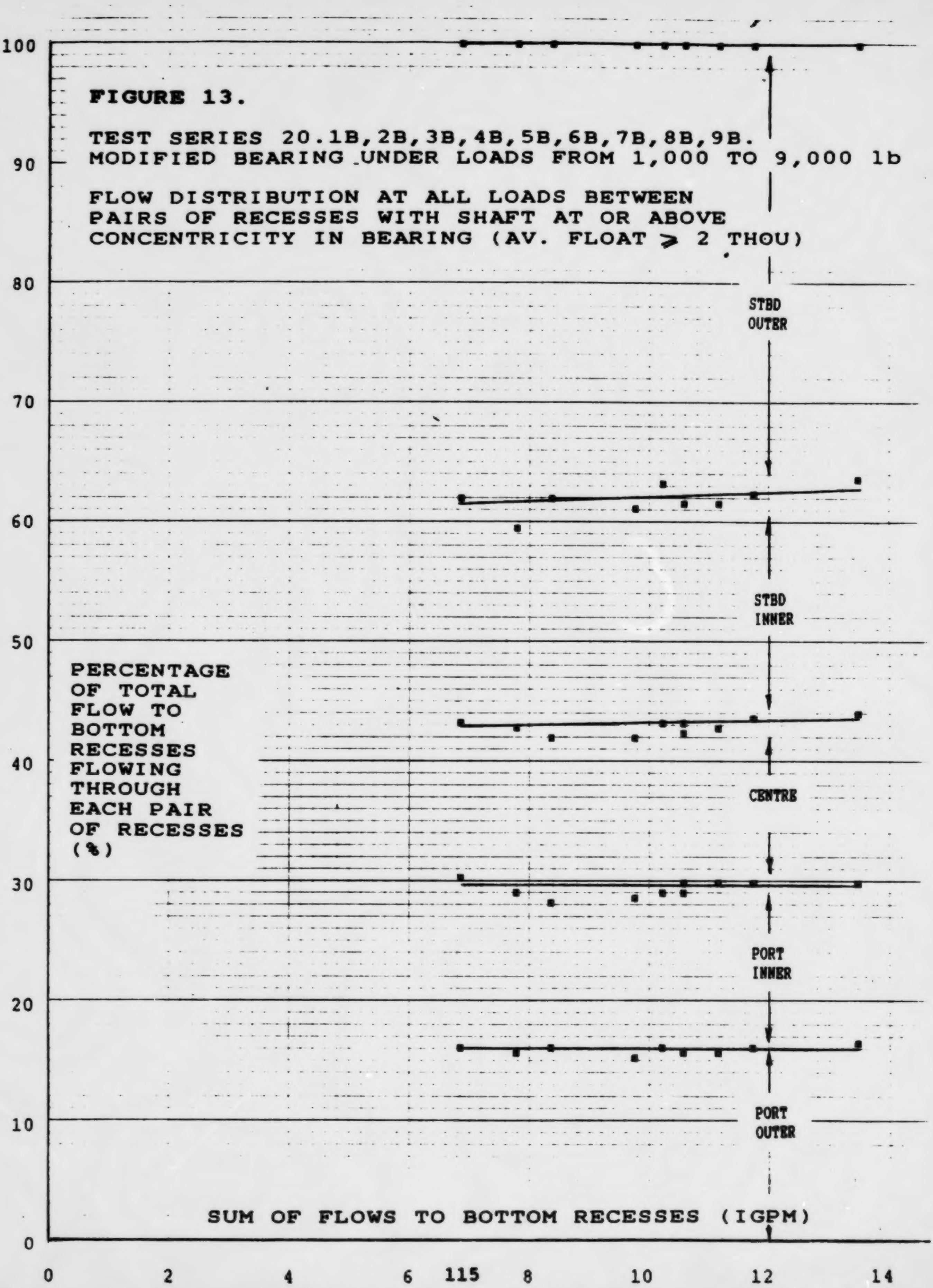


FIGURE 13.

TEST SERIES 20.1B,2B,3B,4B,5B,6B,7B,8B,9B.
MODIFIED BEARING UNDER LOADS FROM 1,000 TO 9,000 lb

FLOW DISTRIBUTION AT ALL LOADS BETWEEN PAIRS OF RECESSES WITH SHAFT AT OR ABOVE CONCENTRICITY IN BEARING (AV. FLOAT ≥ 2 THOU)

FIGURE 14. LATERAL DISPLACEMENT OF THE RISING SHAFT

Estimated on the basis of outer recess flows

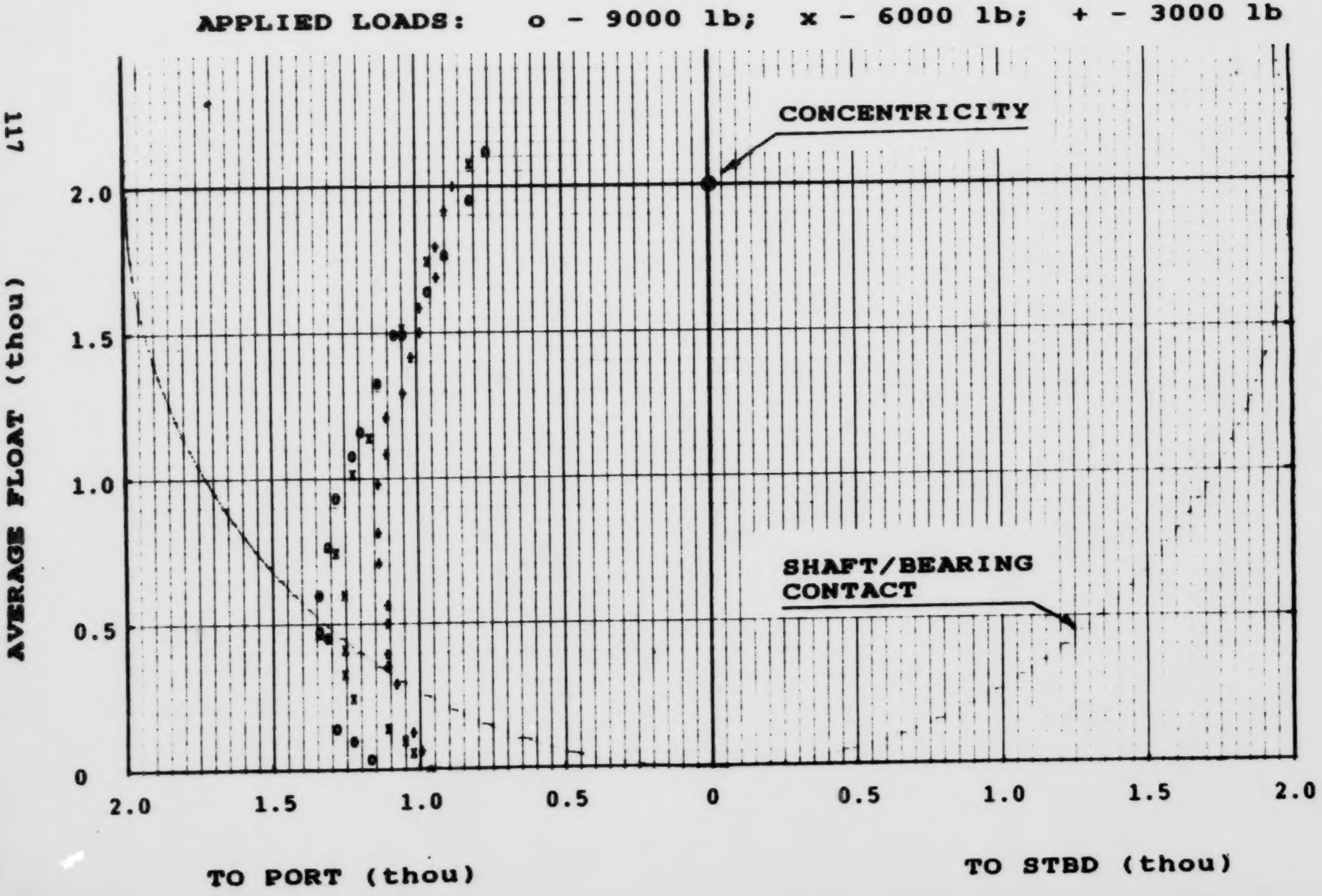


FIGURE 15. LATERAL HYDRAULIC THRUSTS ON THE RISING SHAFT

APPLIED LOAD: 3000 LB

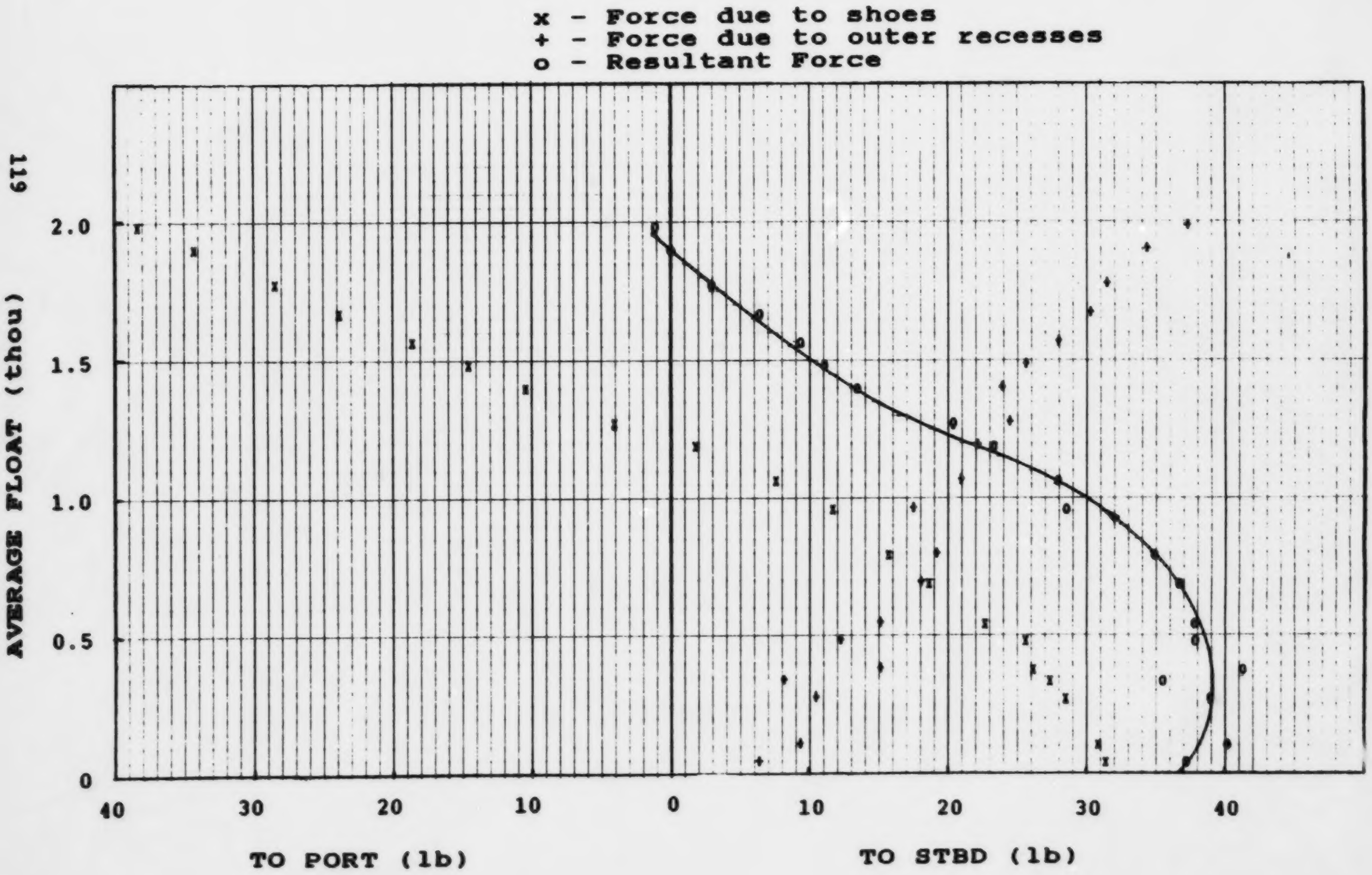


FIGURE 16. LATERAL HYDRAULIC THRUSTS ON THE RISING SHAFT

APPLIED LOAD: 6000 LB

x - Force due to shoes
+ - Force due to outer recesses
o - Resultant Force

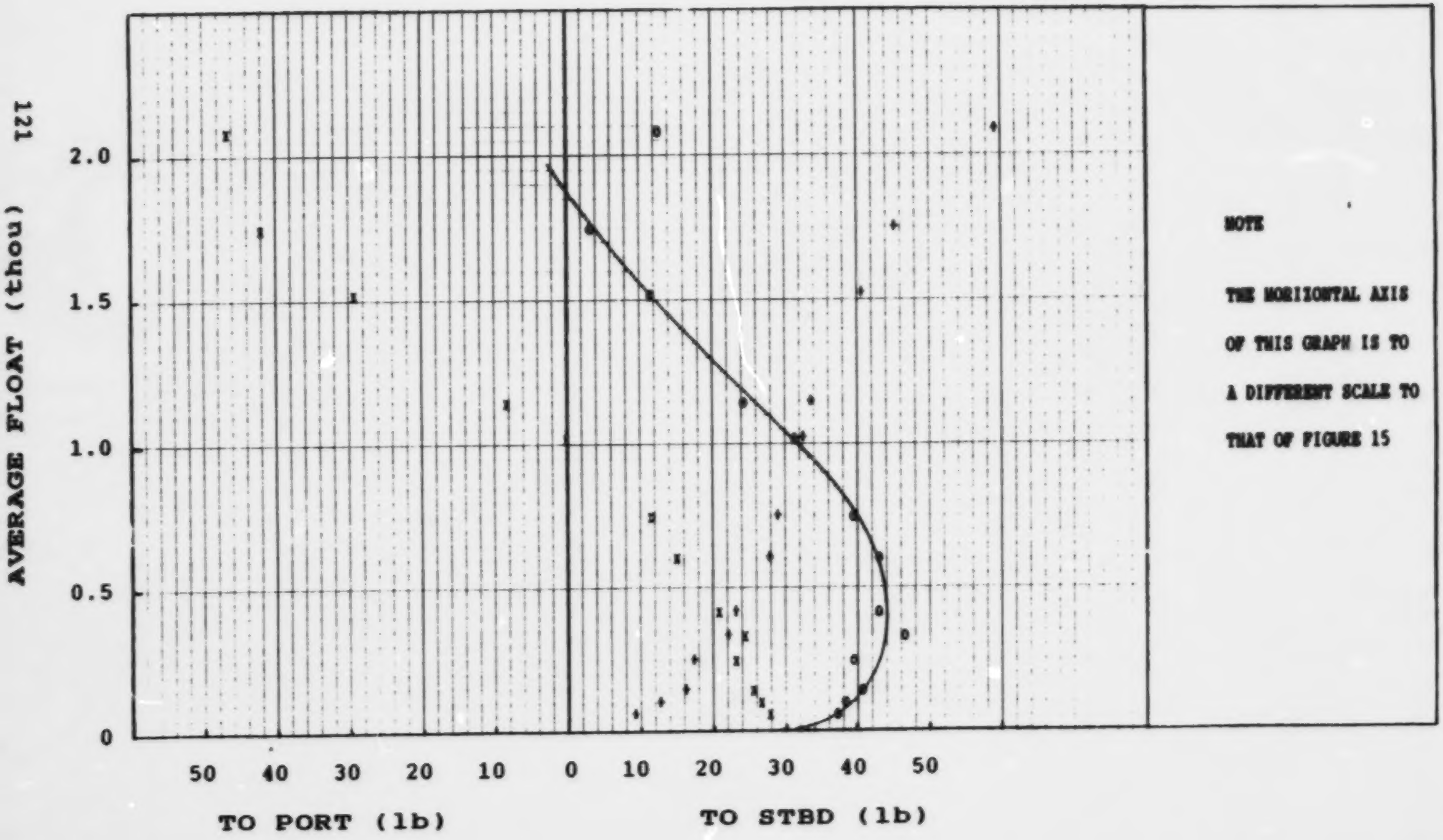


FIGURE 17. LATERAL HYDRAULIC THRUSTS ON THE RISING SHAFT

APPLIED LOAD: 9000 LB

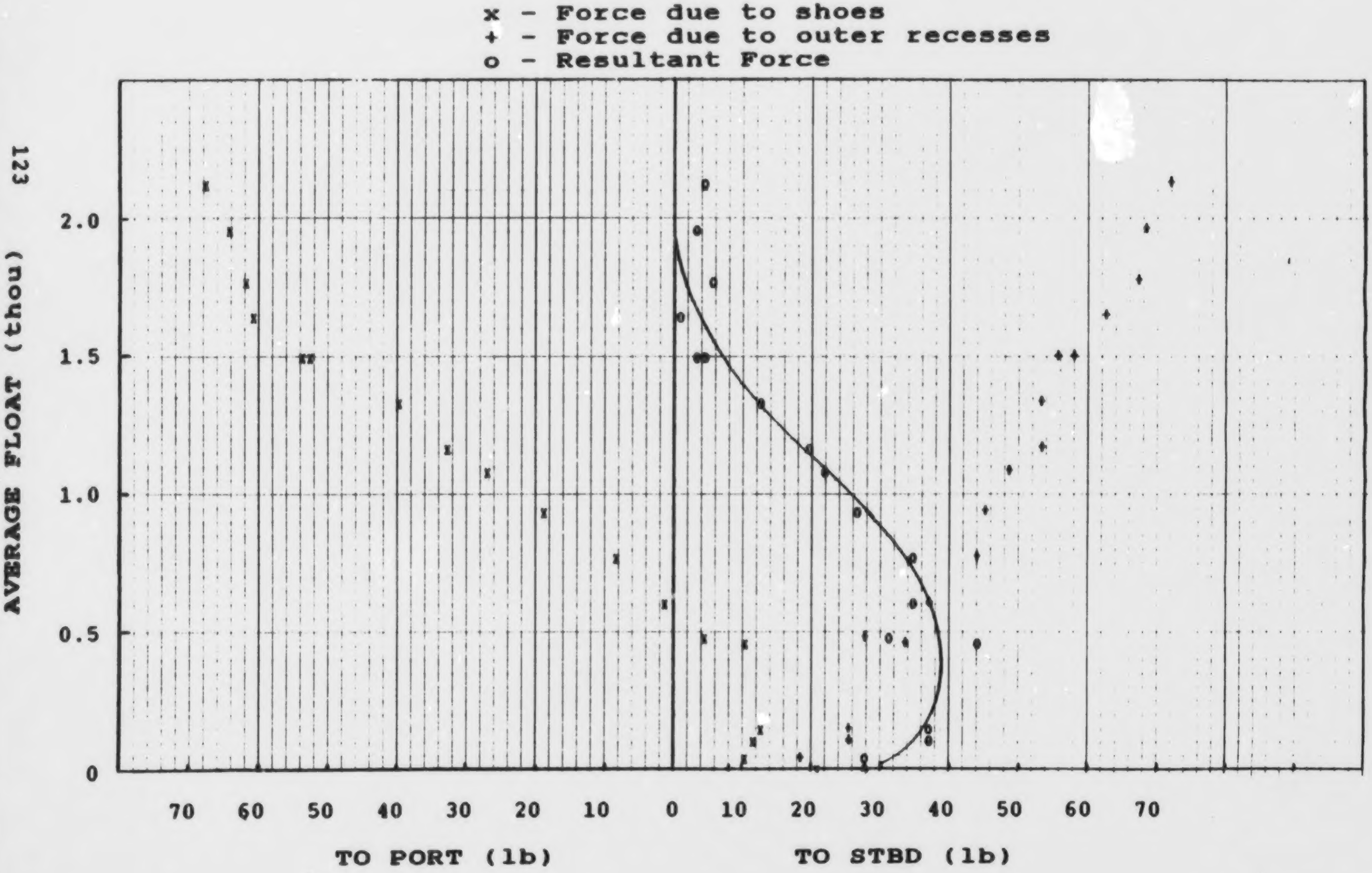
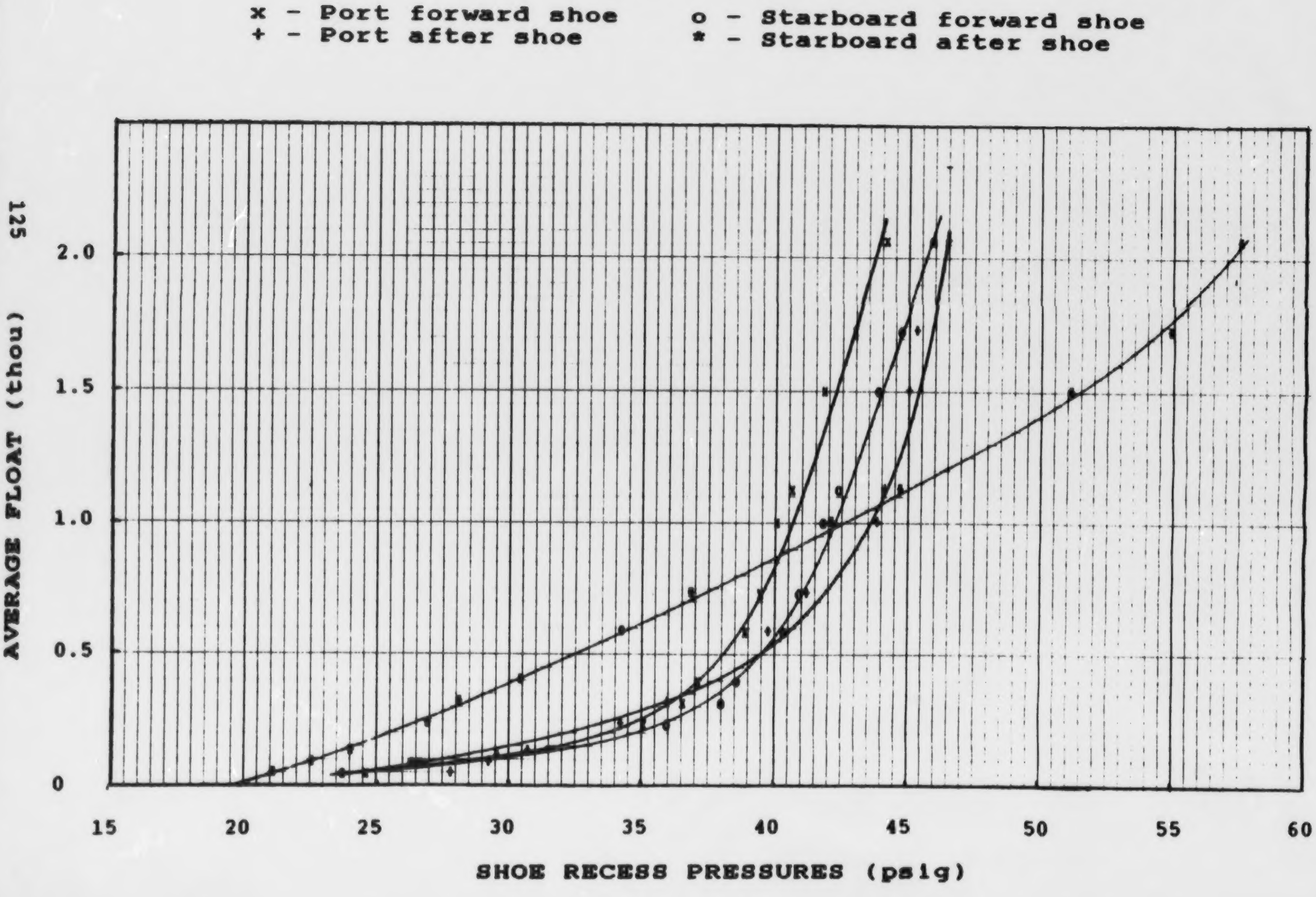
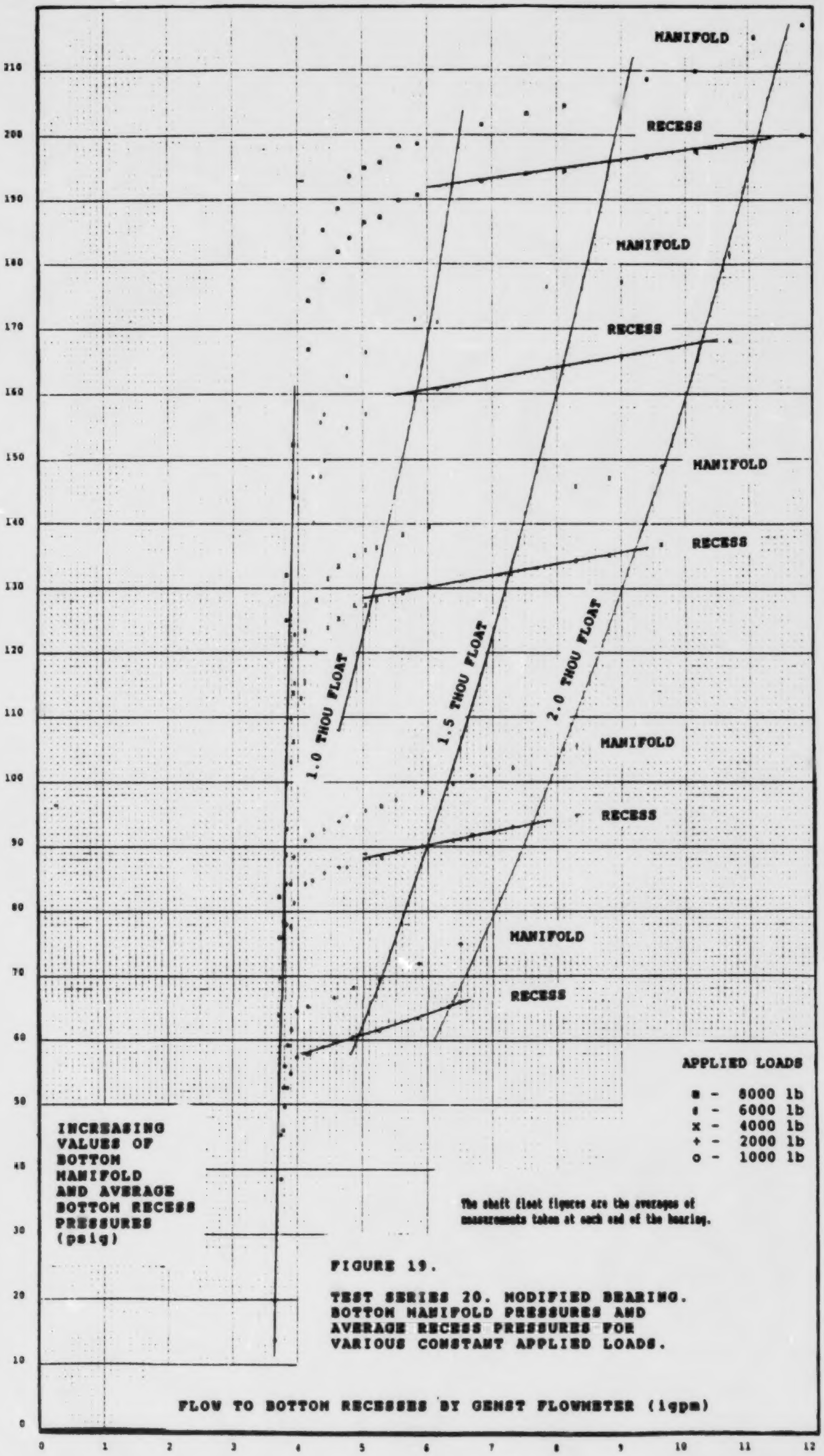


FIGURE 18. PRESSURES EXERTED BY SHOES ON RISING SHAFT

APPLIED LOAD: 6000 LB





The shaft float figures are the averages of measurements taken at each end of the bearing.

FIGURE 19.

TEST SERIES 20. MODIFIED BEARING. BOTTOM MANIFOLD PRESSURES AND AVERAGE RECESS PRESSURES FOR VARIOUS CONSTANT APPLIED LOADS.

APPENDICES

A. THE CHARACTERISTICS OF THE KOBE AND PACO PUMPS

B. OSCILLOSCOPE PHOTOGRAPHS

C. BEARING INSPECTION REPORTS

D. DRAWINGS OF THE BEARING AND TEST RIG PREPARED AT N.E.T.E.

E. DRAWINGS OF THE LOADING MECHANISM

F. MONITORING POINTS, DATA LOGGER CHANNELS AND MEASUREMENT SYSTEM

G. EQUIPMENT AND INSTRUMENTATION LIST

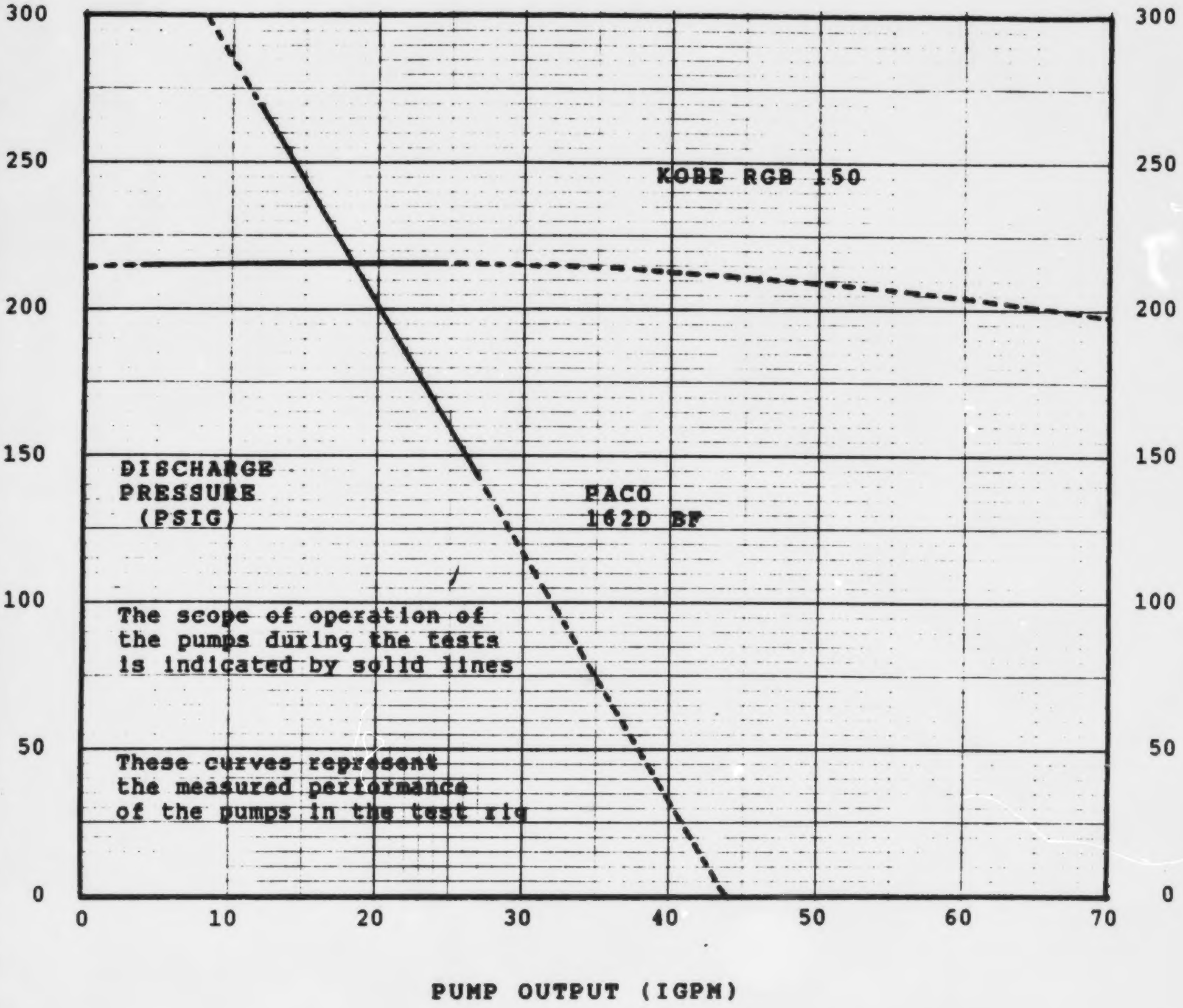
H. PHOTOGRAPHS

BIBLIOGRAPHY

APPENDIX A

THE CHARACTERISTICS OF THE KOBE AND PACO PUMPS

APPENDIX A
THE CHARACTERISTICS OF THE KOBE AND PACO PUMPS



APPENDIX B

OSCILLOSCOPE PHOTOGRAPHS

A.	LOAD 5250 lb	RPM 0
B.	LOAD 5250 lb	RPM 114
C.	LOAD 5250 lb	RPM 221
D.	LOAD 5250 lb	RPM 332
E.	LOAD 5250 lb	RPM 435
F.	LOAD 5250 lb	RPM 551

APPENDIX B

LOAD: 5250 lb

RPM : zero

EXPOSURE: 1 s
(zero rotation),

EACH SUBDIVISION
REPRESENTS 0.0001 in

OSCILLOSCOPE
PHOTOGRAPHS A

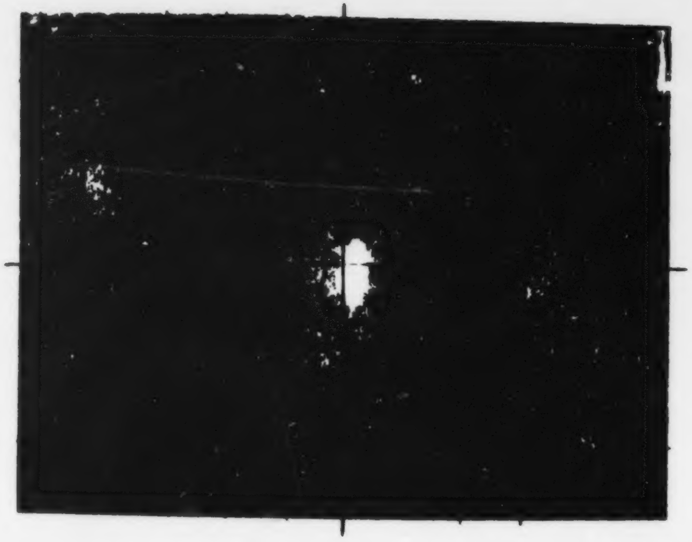


PHOTO No.63-A1

Y Probe No.3 (dry)

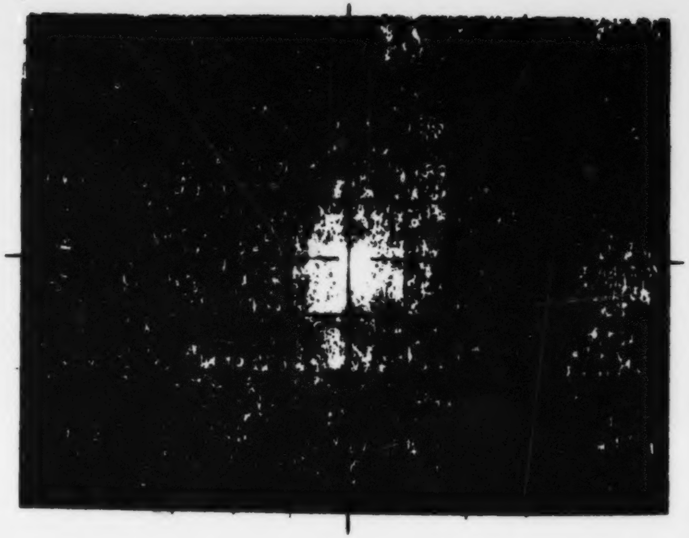


PHOTO No.63-A2

X Probe No.2 (wet)

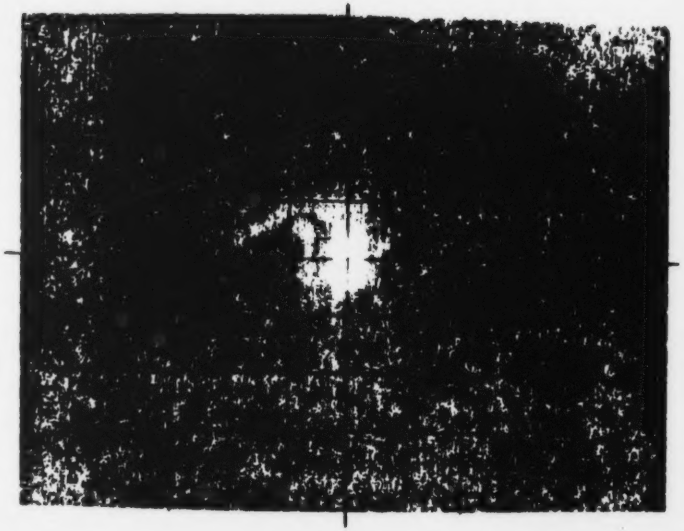


PHOTO No.63-A3

X Probe No.2 (wet) and Y Probe No.3 (dry)

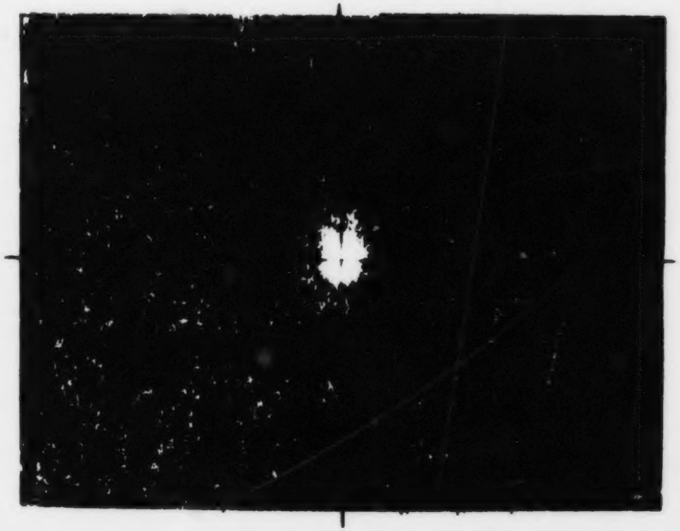


PHOTO No.63-A4

X Probe No.2 (wet) and Y Probe No.1 (wet)

APPENDIX B

LOAD: 5250 lb

RPM : 114

EXPOSURE: 1 s
(1.9 rotations)

EACH SUBDIVISION
REPRESENTS 0.0001 in

OSCILLOSCOPE
PHOTOGRAPHS B

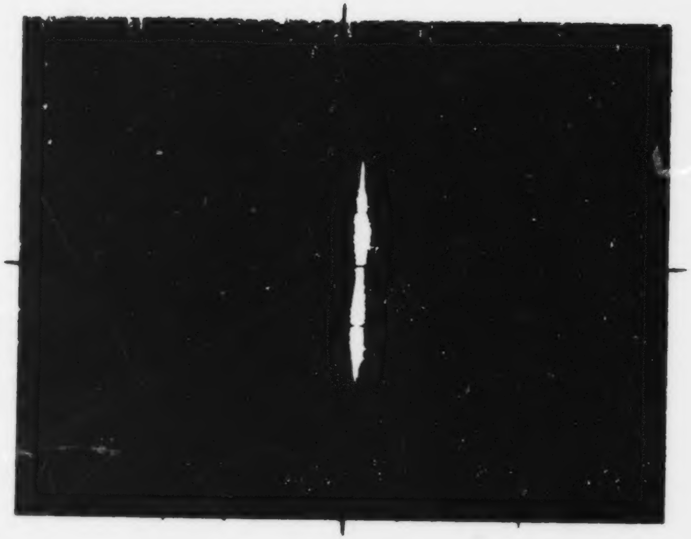
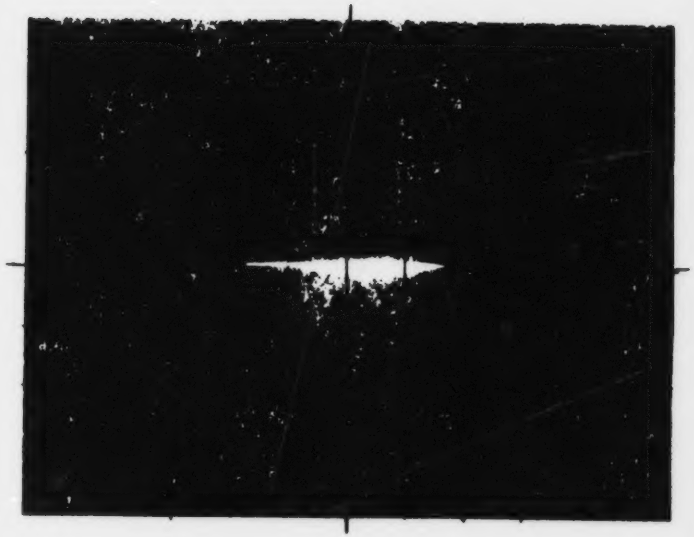


PHOTO No.63-B1

Y Probe No.3 (dry)



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X Probe No.2 (wet)

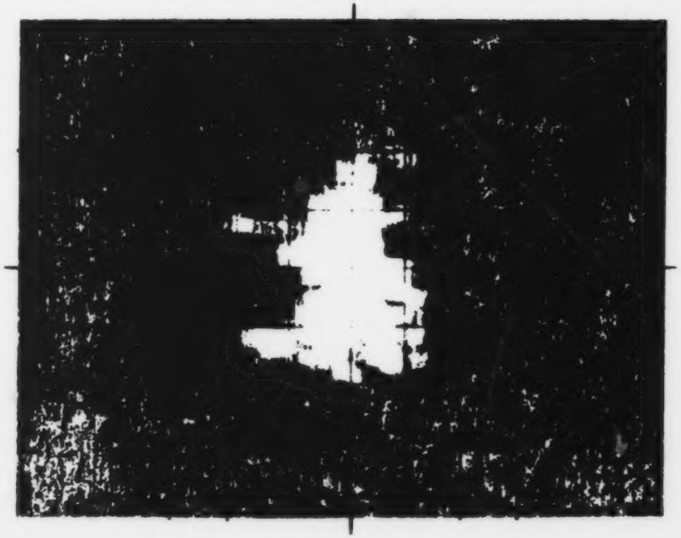


PHOTO No.63-B3

X Probe No.2 (wet) and Y Probe No.3 (dry)

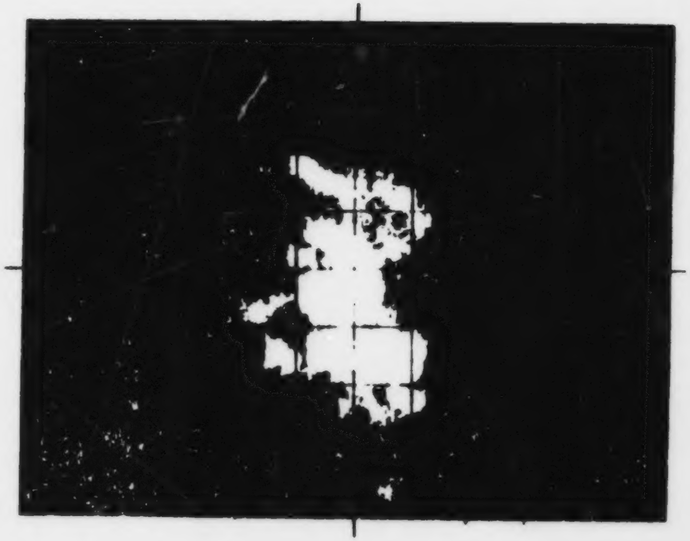


PHOTO No.63-B4

X Probe No.2 (wet) and Y Probe No.1 (wet)

APPENDIX B

LOAD: 5250 lb

RPM : 221

EXPOSURE: 1 s
(3.68 rotations)

EACH SUBDIVISION
REPRESENTS 0.0001 in

OSCILLOSCOPE PHOTOGRAPHS C

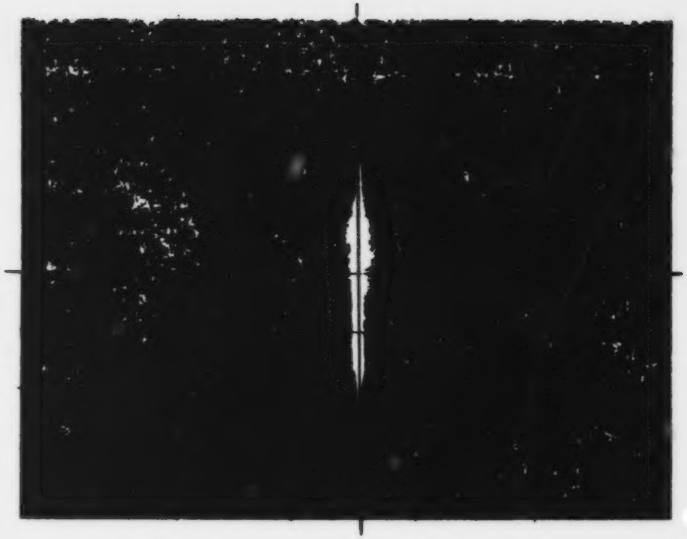


PHOTO No.63-C1

Y Probe No.3 (dry)

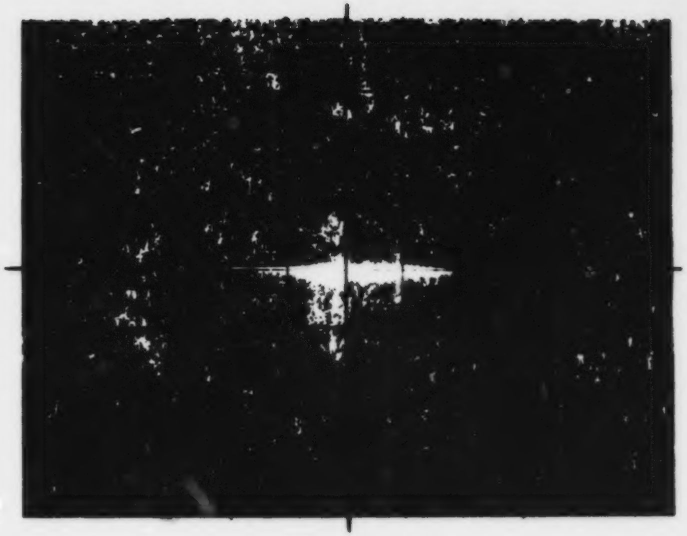


PHOTO No.63-C2

X Probe No.2 (wet)

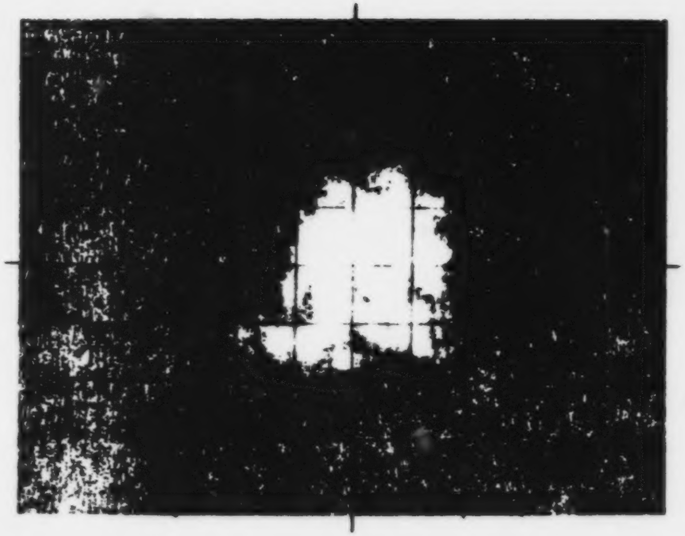


PHOTO No.63-C3

X Probe No.2 (wet) and Y Probe No.3 (dry)

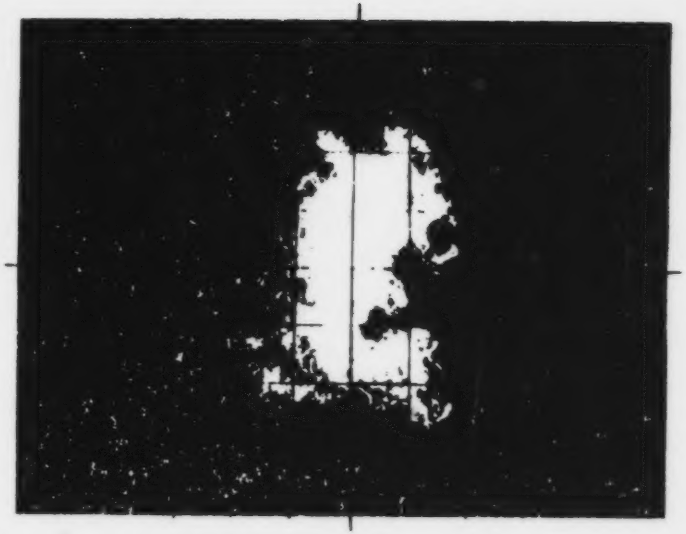


PHOTO No.63-C4

X Probe No.2 (wet) and Y Probe No.1 (wet)

APPENDIX B

LOAD: 5250 lb

RPM : 332

EXPOSURE: 1 s
(5.5 rotations)

EACH SUBDIVISION
REPRESENTS 0.0001 in

OSCILLOSCOPE PHOTOGRAPHS D

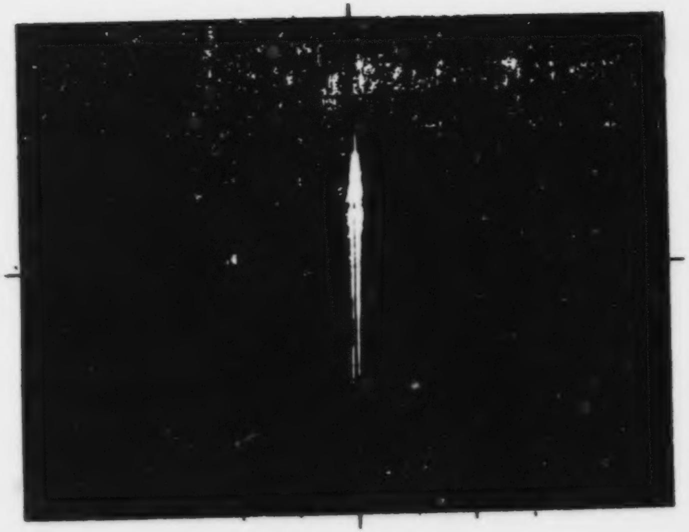


PHOTO No.63-D1

Y Probe No.3 (dry)

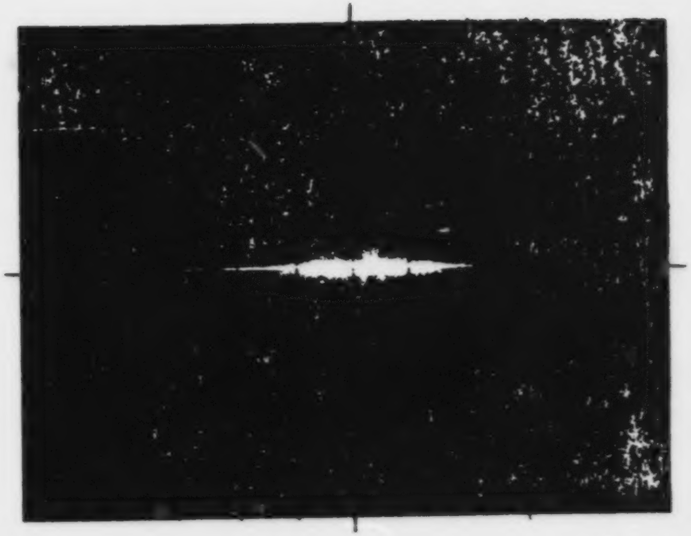


PHOTO No.63-D2

X Probe No.2 (wet)

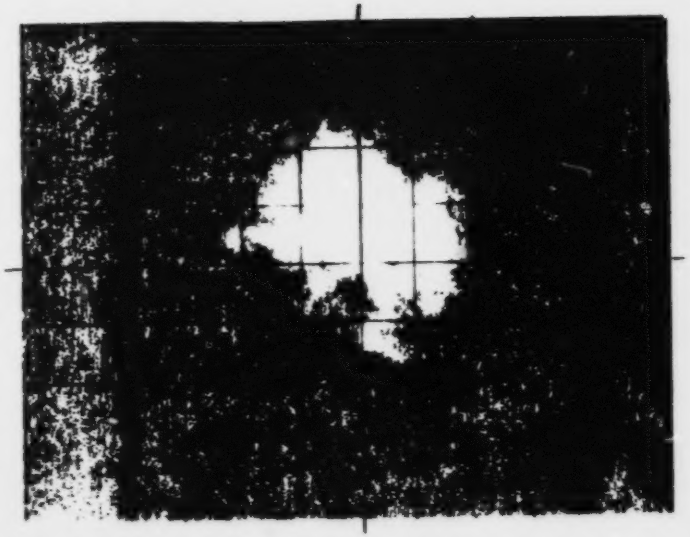


PHOTO No.63-D3

X Probe No.2 (wet) and Y Probe No.3 (dry)

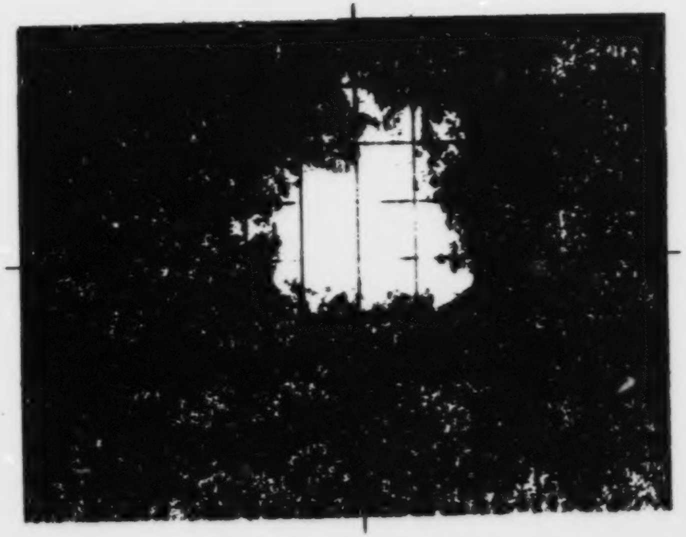


PHOTO No.63-D4

X Probe No.2 (wet) and Y Probe No.1 (wet)

APPENDIX B

LOAD: 5250 lb

RPM :   435

EXPOSURE: 1 s
(7.2 rotations)

EACH SUBDIVISION
REPRESENTS 0.0001 in

OSCILLOSCOPE PHOTOGRAPHS E

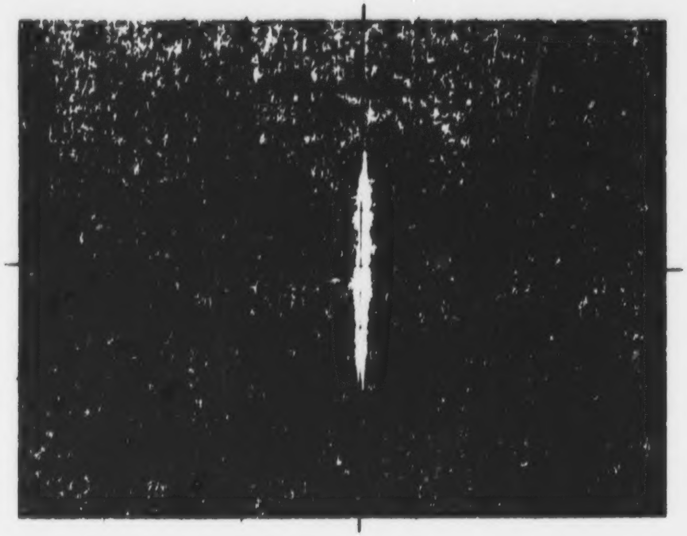


PHOTO No.63-E1

Y Probe No.3 (dry)

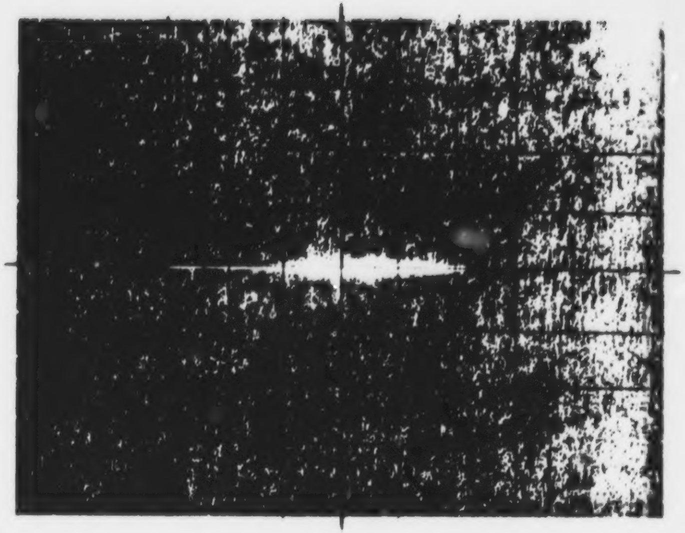


PHOTO No.63-E2

X Probe No.2 (wet)

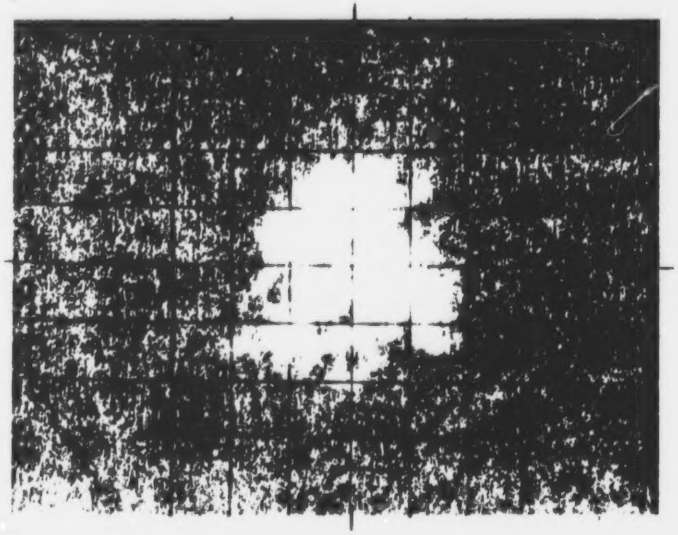


PHOTO No.63-E3

X Probe No.2 (wet) and Y Probe No.3 (dry)

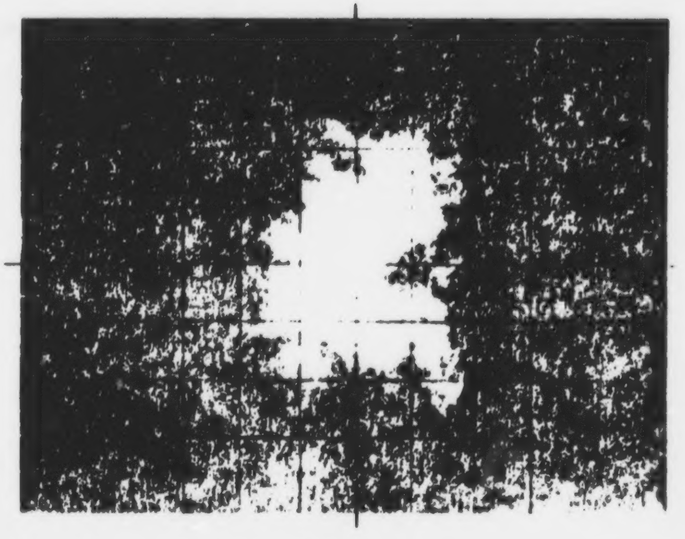


PHOTO No.63-E4

X Probe No.2 (wet) and Y Probe No.1 (wet)

APPENDIX B

LOAD: 5250 lb

RPM : 551

EXPOSURE: 1 s
(9.2 rotations)

EACH SUBDIVISION
REPRESENTS 0.0001 in

OSCILLOSCOPE PHOTOGRAPHS F

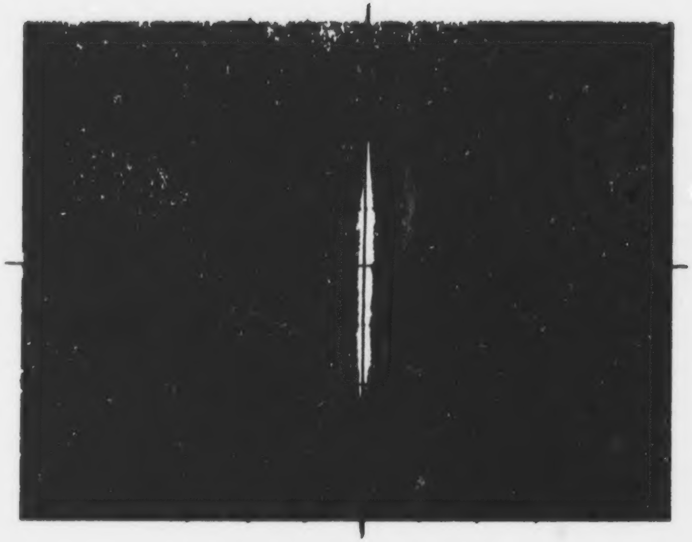


PHOTO No.63-F1

Y Probe No.3 (dry)

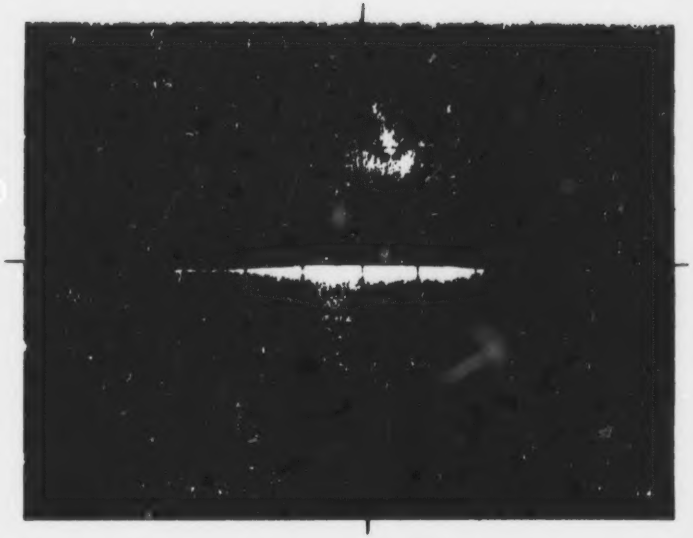


PHOTO No.63-F2

X Probe No.2 (wet)

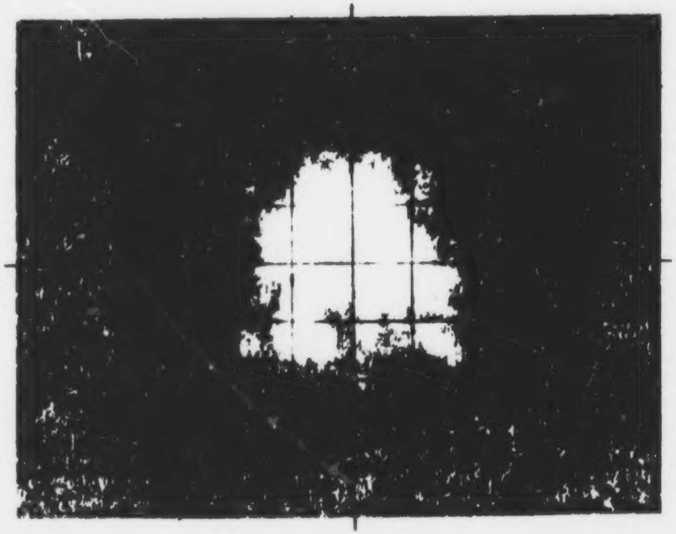


PHOTO No.63-F3

X Probe No.2 (wet) and Y Probe No.3 (dry)

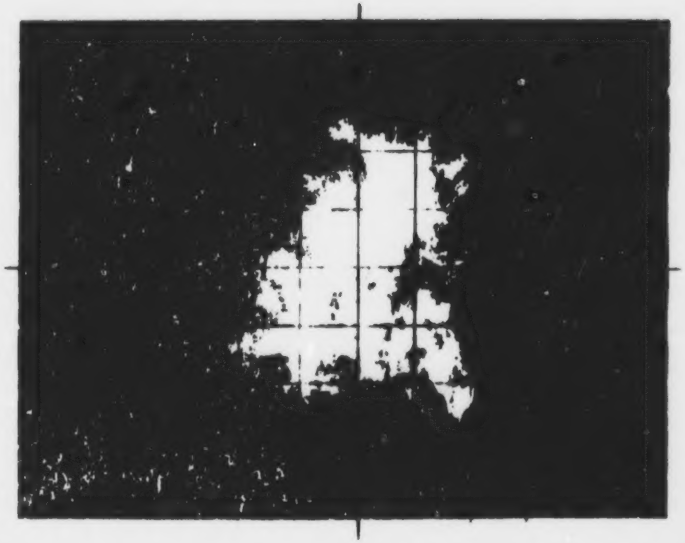


PHOTO No.63-F4

X Probe No.2 (wet) and Y Probe No.1 (wet)

APPENDIX C

BEARING INSPECTION REPORTS

REPORT No.1

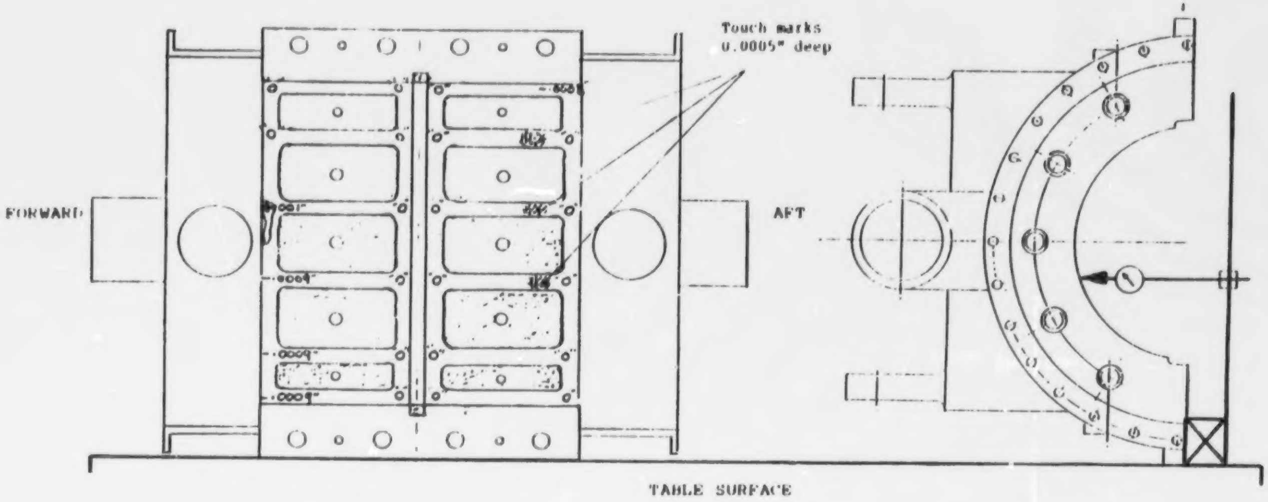
BOTTOM HALF BEARING

REPORT No.2

TOP HALF BEARING

APPENDIX C
NAVAL ENGINEERING TEST ESTABLISHMENT
INSPECTION REPORT No.1

Figures represent wear ( ) or deposits of calcium (+)

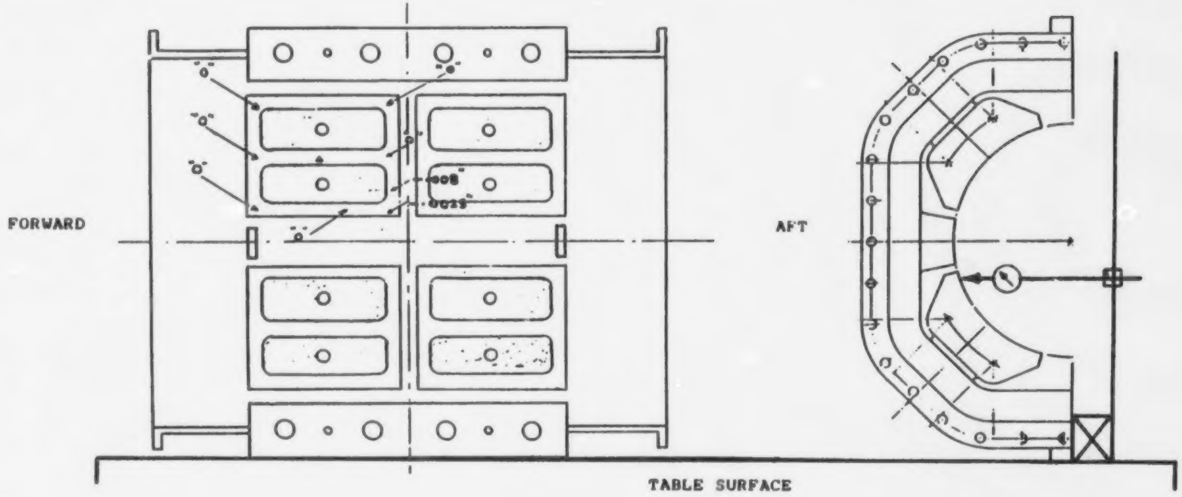

Touch marks
0.0005" deep
FORWARD
AFT
TABLE SURFACE
.001"
.0004"
.0009"
.0009"
.0008"

BOTTOM HALF BEARING

CLOCK GAUGE READINGS OF DEVIATION
OF BORED BEARING SURFACE FROM
PARALLEL WITH HORIZONTAL JOINT FACE

APPENDIX C
NAVAL ENGINEERING TEST ESTABLISHMENT
INSPECTION REPORT No.2

Figures represent wear (-) or deposits of calcium (+)


FORWARD
AFT
.008
.0025
TABLE SURFACE

TOP HALF BEARING

CLOCK GAUGE READINGS OF DEVIATION
OF BORED BEARING SURFACE FROM
PARALLEL WITH HORIZONTAL JOINT FACE

APPENDIX D

DRAWINGS OF THE BEARING AND TEST RIG PREPARED AT N.E.T.E.

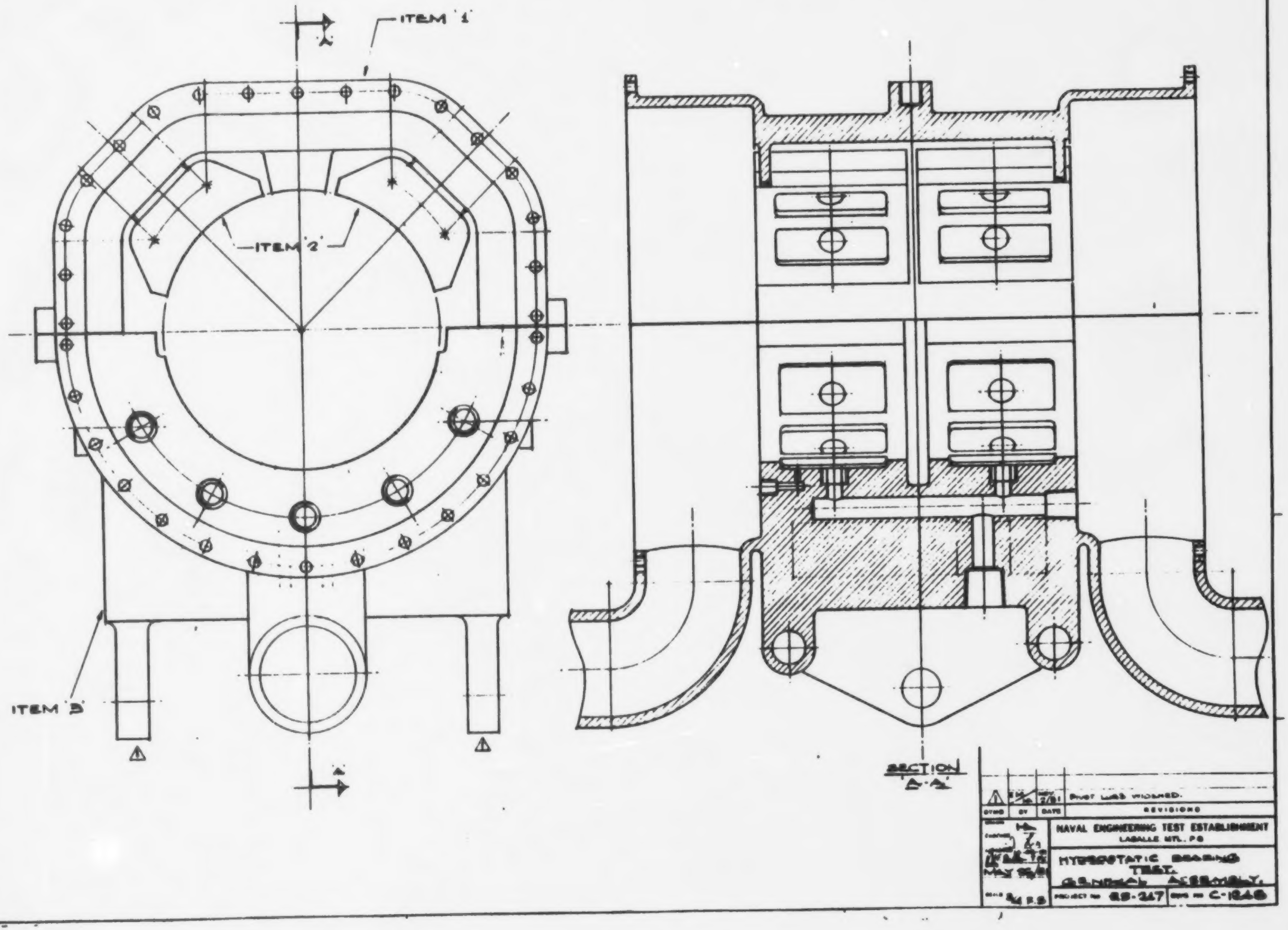
APPENDIX D

DRAWINGS OF THE BEARING AND TEST RIG PREPARED AT THE NAVAL ENGINEERING TEST ESTABLISHMENT

	TITLE OF DRAWING	DWG.NO.
	6.5" MODEL HYDROSTATIC STERN TUBE BEARING	
*	GENERAL ASSEMBLY	C - 1248
*	DETAILS OF BEARING (TOP) AND PISTONS	D - 1341
*	DETAILS OF BEARING (BOTTOM)	D - 1342
	SHAFT	
*	DETAILS OF MAIN SHAFT	D - 1355
	DETAILS OF ROUGH (PRE-)MACHINING OF SHAFT	C - 1275
	DETAILS OF (SHAFT) SHIPPING AND STORAGE CRATE	D - 1357
	TEST RIG TABLE	
	DETAILS OF TABLE	C - 1271
	DETAILS OF BASE FRAME	C - 1272
	DETAILS OF STOOLS (BASE FRAME)	D - 1359
	GENERAL ASSEMBLY, STOOLS ETC. ON BASE FRAME	C - 1277
*	GENERAL ARRANGEMENT (PRELIMINARY)	D - 1356
	TEST RIG LOADING MECHANISM	
*	FABRICATION DETAILS OF LOADING MECHANISM	D - 1358
	DETAILS OF BRACKETS	C - 1299
	LAYOUT OF TEST BAY	
	SCHEMATIC OF TEST RIG SET-UP (PRELIMINARY)	D - 1360
*	TEST RIG SCHEMATIC (FINAL)	C - 1285
	HIGH PRESSURE CIRCUITRY	
	DETAILS OF PRESSURE PIPING (ST-ST)	C - 1281
	MANIFOLD FOR BOTTOM HALF BEARING	C - 1283
	MANIFOLD FOR PISTONS (TOP HALF BEARING)	D - 1368
	LOW PRESSURE CIRCUITRY	
	DETAILS OF PRESSURE PIPING (PLASTIC)	D - 1364
	LAYOUT OF RECOVERY SYSTEM (SEA WATER)	D - 1361
	FABRICATION OF PLASTIC TANK	D - 1362

* Drawings included in this Appendix

ITEM	NO. REQ'D	DESCRIPTION	MATERIAL	NATO STOCK Nº	REMARKS


ITEM 1
ITEM 2
ITEM 3
A
A
1
1
SECTION A-A

SYMB	BY	DATE	REVISIONS
1		NOV. 7/61	PIVOT WAS WIDENED.

NAVAL ENGINEERING TEST ESTABLISHMENT
LASALLE MTL. P.Q.

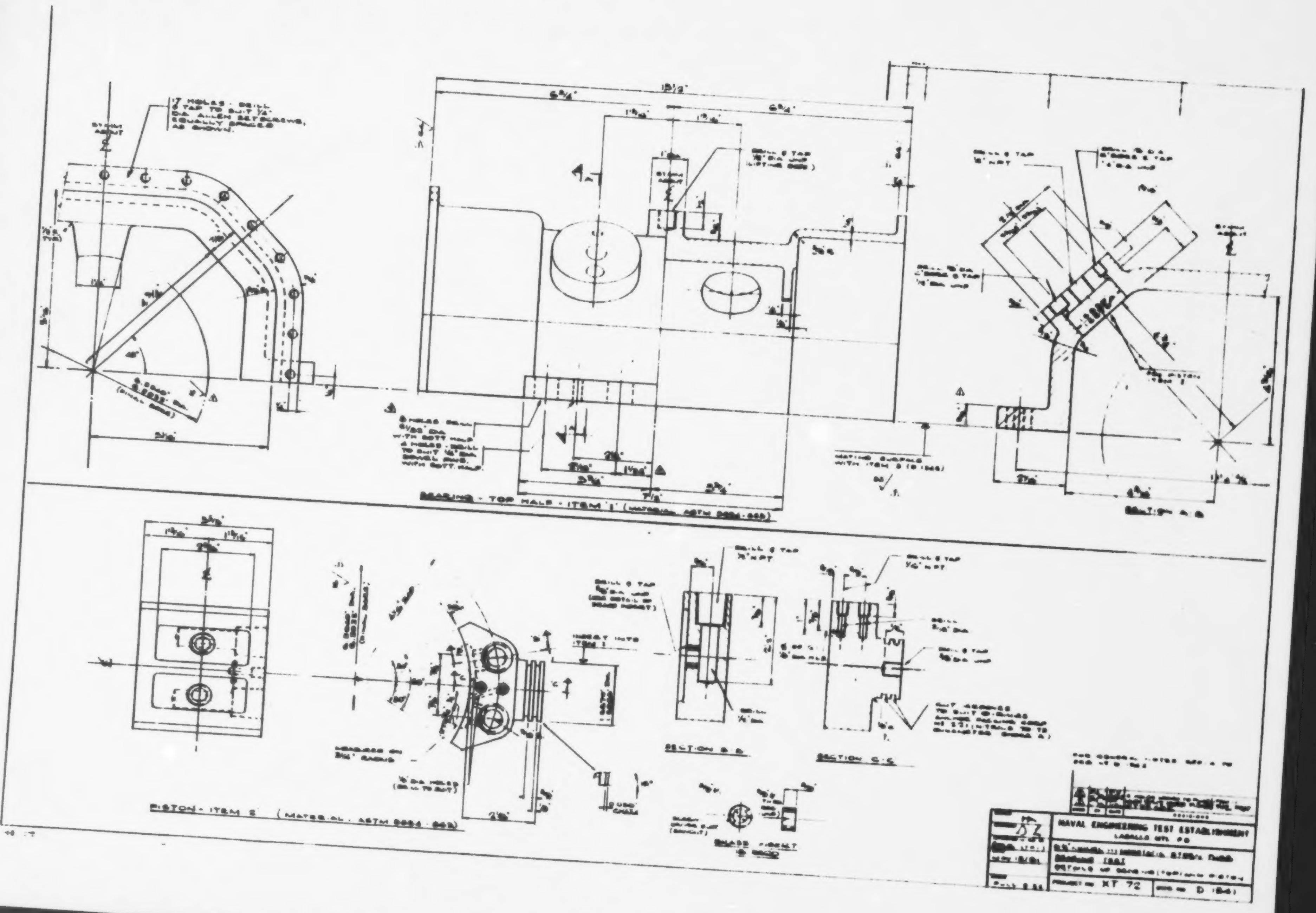
HYDROSTATIC BEARING TEST.
GENERAL ASSEMBLY.

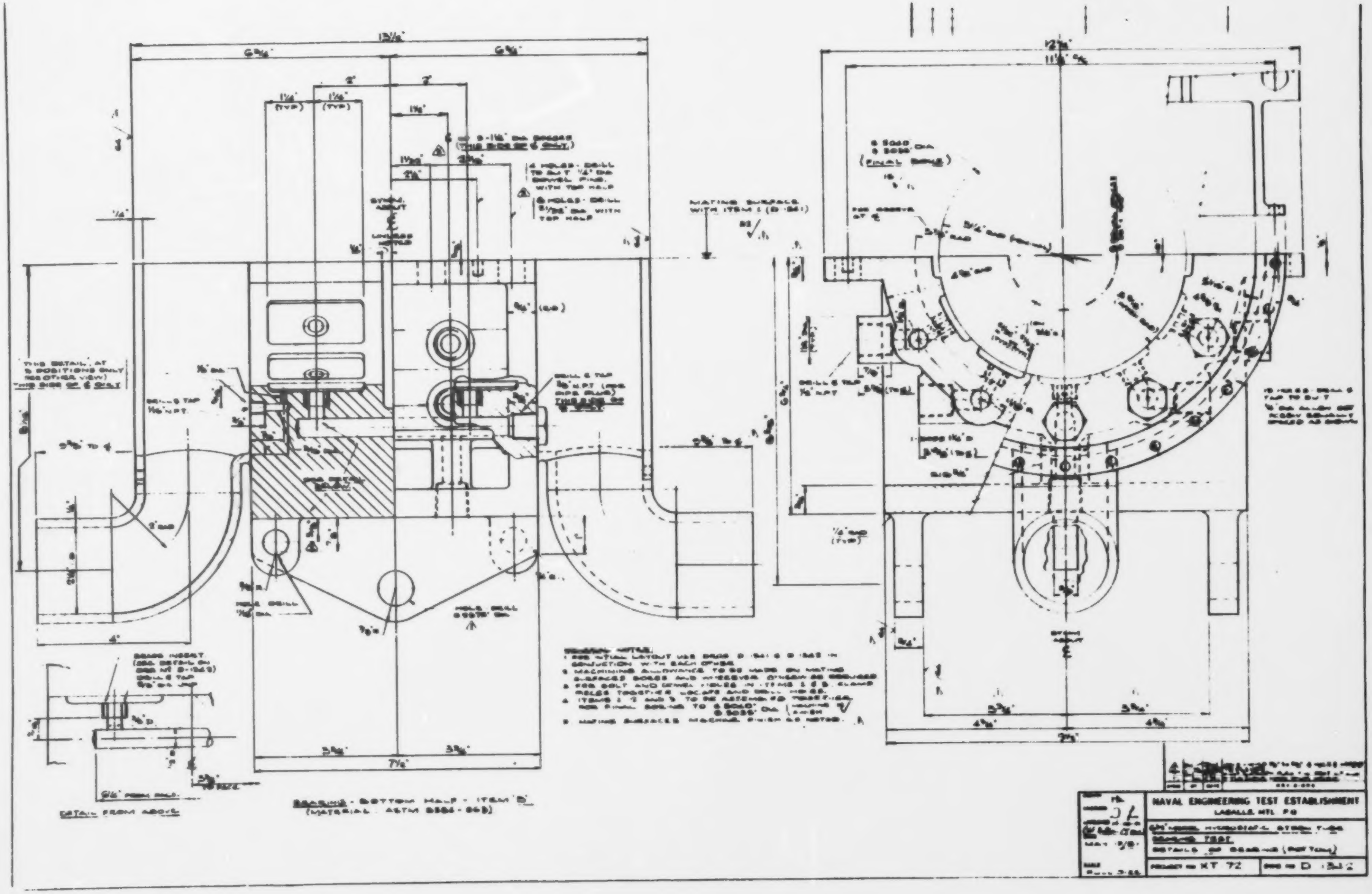
MAY 25/61

SCALE 3/4 F.S.

PROJECT No 65-247

DWG No C-1246


17 HOLES - DRILL & TAP TO SUIT 1/4" DIA. ALLEN SETSCREWS, EQUALLY SPACED AS SHOWN.
BEARING - TOP HALF - ITEM 1 (MATERIAL ASTM B584-...)
MATING SURFACE WITH ITEM 3
SECTION A-A
PISTON - ITEM 2 (MATERIAL - ASTM B584 - ...)
SECTION B-B
SECTION C-C
DRILL & TAP 1/8" NPT
NAVAL ENGINEERING TEST ESTABLISHMENT
XT 72
D 1641


13½"
6¾"
6¾"
2"
2"
1¼" (TYP)
1¼" (TYP)
1¾"
¼"
9⁄16"
2¾"
SYMM. ABOUT ℄ UNLESS NOTED
THIS DETAIL, AT 2 POSITIONS ONLY (SEE OTHER VIEW) THIS SIDE OF ℄ ONLY
DRILL & TAP 1/16" NPT.
DRILL & TAP 3/8" NPT (FOR PIPE PLUG) THIS SIDE OF ℄ ONLY
3⅜" TO 4
4"
HOLE DRILL 7/16" DIA.
HOLE DRILL 0.5075" DIA.
7⅝"
3⅝"
3⅝"
MATING SURFACE WITH ITEM 1 (D-1341)
12⅝"
11⅛"
6.5040" DIA. 6.5035" DIA. (FINAL BORE)
4 HOLES DRILL & TAP TO SUIT 3/4" DIA. BOLT
SYMM. ABOUT ℄
DRILL & TAP ½" NPT
4⅞"
4⅞"
9¾"
3⅞"
3⅞"
Boss insert (see detail on DWG No D-1343) drill & tap 5/8" dia.
DETAIL FROM ABOVE

BEARING - BOTTOM HALF - ITEM 2
(MATERIAL : ASTM B584-863)

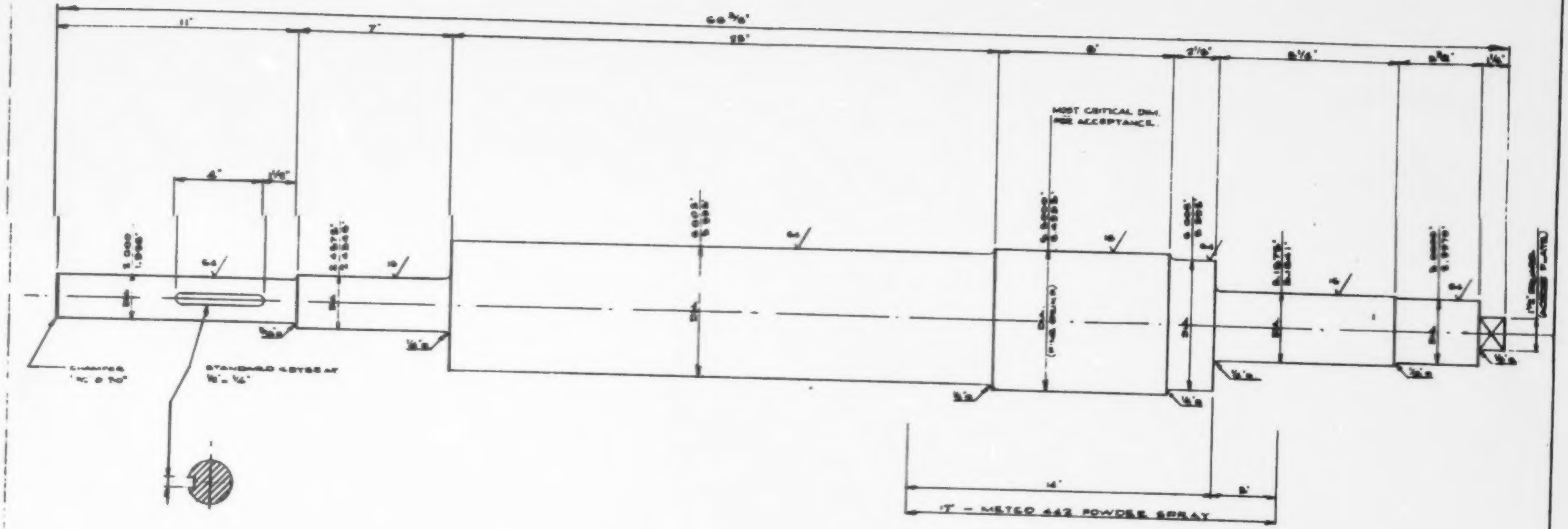
GENERAL NOTES.
1 FOR INITIAL LAYOUT USE DRGS D-1341 & D-1342 IN CONJUNCTION WITH EACH OTHER.
2 MACHINING ALLOWANCE TO BE MADE ON MATING SURFACES BORES AND WHEREVER OTHERWISE REQUIRED.
3 FOR BOLT AND DOWEL HOLES IN ITEMS 1 & 2, CLAMP HALVES TOGETHER, LOCATE AND DRILL HOLES.
4 ITEMS 1, 2 AND 3 TO BE ASSEMBLED TOGETHER FOR FINAL BORING TO 6.5040" / 6.5035" DIA.
5 MATING SURFACES MACHINE FINISH AS NOTED.

NAVAL ENGINEERING TEST ESTABLISHMENT
LASALLE, MTL. PQ

6⅝" MODEL HYDRODYNAMIC STERN TUBE
BEARING TEST
DETAILS OF BEARING (BOTTOM)

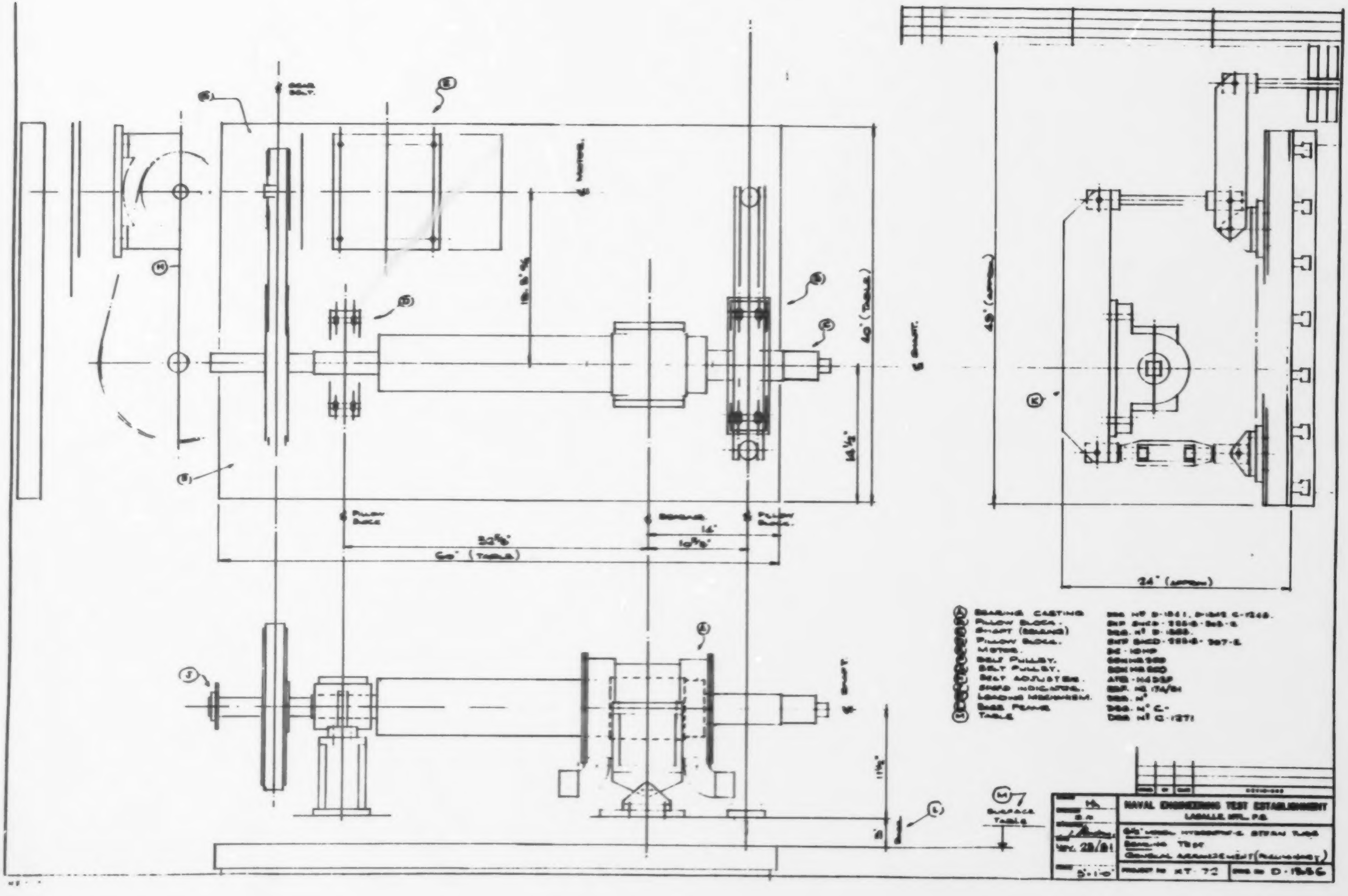
PROJECT No KT 72
DWG No D-1342

MAY 1968


66 3/8"
11"
7"
28"
8"
2 1/16"
8 1/4"
3 3/8"
1 1/4"
4"
1 1/2"
2.000
1.998
64
16
MOST CRITICAL DIM.
FOR ACCEPTANCE.
CHAMFER
1/16" @ 30°
STANDARD KEYSEAT
1/2" x 1/4"
14"
3"
17" - METCO 442 POWDER SPRAY

NOTES:
REF DWG Nº TDC 818-5005
MATERIAL 6⅛" DIA BAR - 66½" LONG.
AISI C4140 (STRESS RELIEVED)

DRAWN HL	NAVAL ENGINEERING TEST ESTABLISHMENT LASALLE, MTL. P.Q.
DATE 6/61	1/3 MODEL HYDROSTATIC STERN TUBE BEARING TEST DETAILS OF MAIN SHAFT
SCALE 1/4 F.S.	PROJECT NO XT-76
	DWG NO D-1388



℄ GEAR BELT
℄ MOTOR
℄ SHAFT
℄ PILLOW BLOCK
℄ BEARING
℄ PILLOW BLOCK
19.5"
40" (TABLE)
14½"
32⅝"
14"
10⅝"
60" (TABLE)
49" (APPROX)
24" (APPROX)
11½"
3"
SURFACE TABLE
A
B
C
D
E
F
G
H
J
K
L
M

Ⓐ	BEARING CASTING	DWG. Nº D-1341, D-1342 C-1348.
Ⓑ	PILLOW BLOCK.	SKF [illegible]
Ⓒ	SHAFT (BEARING)	DWG. Nº D-[illegible].
Ⓓ	PILLOW BLOCK.	SKF [illegible]
Ⓔ	MOTOR.	DC-10HP
Ⓕ	BELT PULLEY.	[illegible]
Ⓖ	BELT PULLEY.	[illegible]
Ⓗ	BELT ADJUSTER.	[illegible]
Ⓙ	SPEED INDICATOR.	[illegible]
Ⓚ	LOADING MECHANISM.	DWG. Nº
Ⓛ	BASE FRAME	DWG. Nº C-
Ⓜ	TABLE	DWG. Nº C-1271

NAVAL ENGINEERING TEST ESTABLISHMENT
LASALLE, MTL. P.Q.

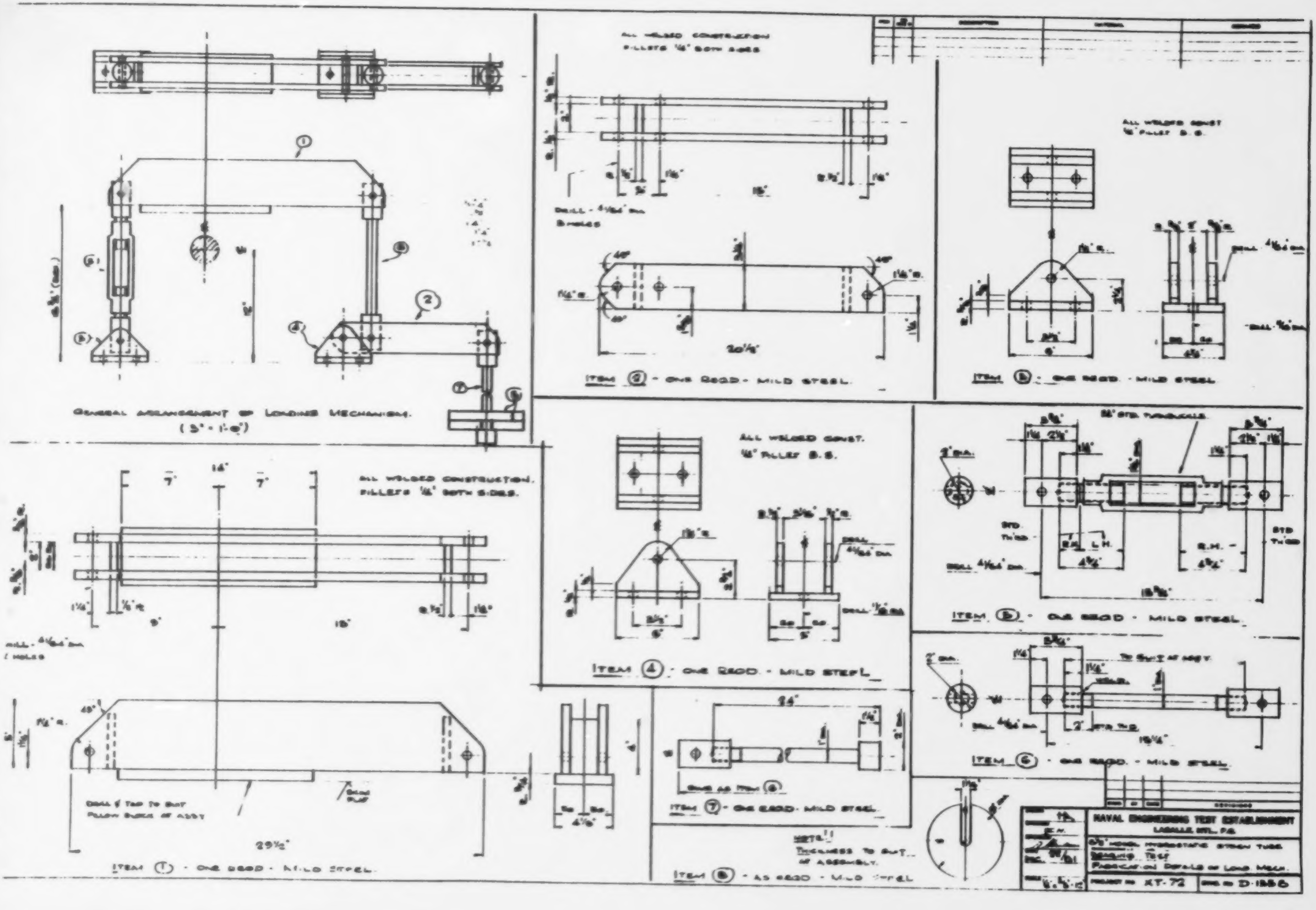
6¼" MODEL HYDROFOIL STERN TUBE
BEARING TEST
GENERAL ARRANGEMENT (PRELIMINARY)

NOV. 28/61

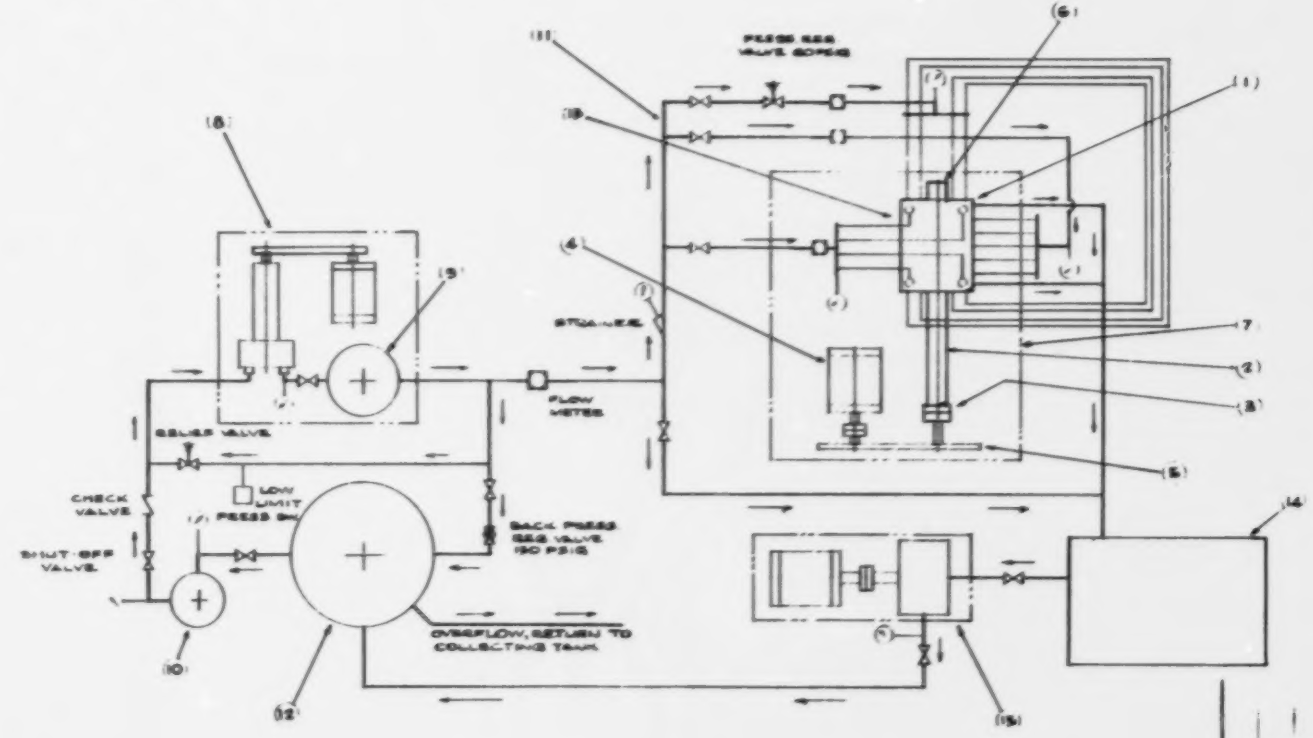
3"=1'-0"

PROJECT NO XT 72

DWG NO D-1856

GENERAL ARRANGEMENT OF LOADING MECHANISM.
(3" = 1'-0")
ALL WELDED CONSTRUCTION. FILLETS ¼" BOTH SIDES.
DRILL & TAP TO SUIT FOLLOW BLOCK AT ASSY
29½"
ITEM ① - ONE REQD - MILD STEEL.
ALL WELDED CONSTRUCTION FILLETS ¼" BOTH SIDES
DRILL - 41/64" DIA. 2 HOLES
20¼"
ITEM ② - ONE REQD - MILD STEEL.
ALL WELDED CONST. ¼" FILLET B.S.
ITEM ③ - ONE REQD - MILD STEEL.
ALL WELDED CONST. ¼" FILLET B.S.
ITEM ④ - ONE REQD - MILD STEEL.
5/8" STD. TURNBUCKLE
STD. THDS.
L.H.
R.H.
DRILL 41/64" DIA.
ITEM ⑤ - ONE REQD - MILD STEEL.
TO SUIT AT ASSY.
ITEM ⑥ - ONE REQD - MILD STEEL.
24"
SAME AS ITEM ⑥
ITEM ⑦ - ONE REQD - MILD STEEL.
NOTE: THICKNESS TO SUIT AT ASSEMBLY.
ITEM ⑧ - AS REQD - MILD STEEL.
NAVAL ENGINEERING TEST ESTABLISHMENT
LASALLE, MTL, P.Q.
6½" HYDROSTATIC STRAIN TUBE
BENDING TEST
FABRICATION DETAILS OF LOAD MECH.
PROJECT No XT-72
DWG No D-1856

ITEM	DESCRIPTION	MATERIAL	REMARKS
1	HYDROSTATIC STERN TUBE BEARING		NETE DWG D1841, D1843 & C1240
2	HYDROSTATIC STERN TUBE SHAFT.		NETE DWG D1859
3	PILLOW BLOCKS TO SUPPORT #2		SKF FOR 2 7/16" & 3 7/16" SHAFT
4	VARIABLE SPEED ELECT. MOTOR		10HP DC - 850/3500RPM.
5	DRIVE MECHANISM.		NETE DWG D1856
6	BEARING LOADING DEVICE		NETE DWG D1880
7	BEARING TEST RIG TABLE.		SIZE 40" × 60"
8	HIGH PRESS. PUMP/MOTOR.		100 IGPM - 200PSIG/75HP 3600RPM
9	HEAT EXCHANGER.		100 IGPM - 200PSIG. TUBE [illegible] C.N.
10	FILTER		100 IGPM - 200PSIG. 10/14 MICRON
11	MISC. PIPING FITTINGS, GAUGES & VALVES.		ST. STEEL 316 & POLYPROPYLENE
12	SEAWATER SUPPLY TANK.		300 GAL. ST. STEEL 316
13	INSTRUM. PACKAGE		PRESS/FLOW TRANSD'S & RECORD.
14	SEAWATER COLLECTING TANK.		75 GAL. POLYETHYLENE.
15	LOW PRESS. PUMP/MOTOR.		80 IGPM - 30PSIG/3HP - 3450 RPM.


(8)
(15)
(11)
PRESS REG VALVE 60PSIG
(13)
(6)
(1)
(4)
(7)
(2)
(3)
(5)
(9)
(13)
(13)
(13)
STRAINER
FLOW METER
RELIEF VALVE
LOW LIMIT PRESS SW
(13)
CHECK VALVE
SHUT-OFF VALVE
BACK PRESS REG VALVE 130 PSIG
OVERFLOW, RETURN TO COLLECTING TANK
(10)
(12)
(14)
(15)
(13)

SYMB	BY	DATE	REVISIONS

NAVAL ENGINEERING TEST ESTABLISHMENT
LASALLE MTL. P.Q.

6½" NAVAL HYDROSTATIC STERN TUBE BEARING TEST.
TEST RIG SCHEMATIC.

AUG 24/62
N.T.S.
PROJECT No XT-72
DWG No C-1285

APPENDIX E

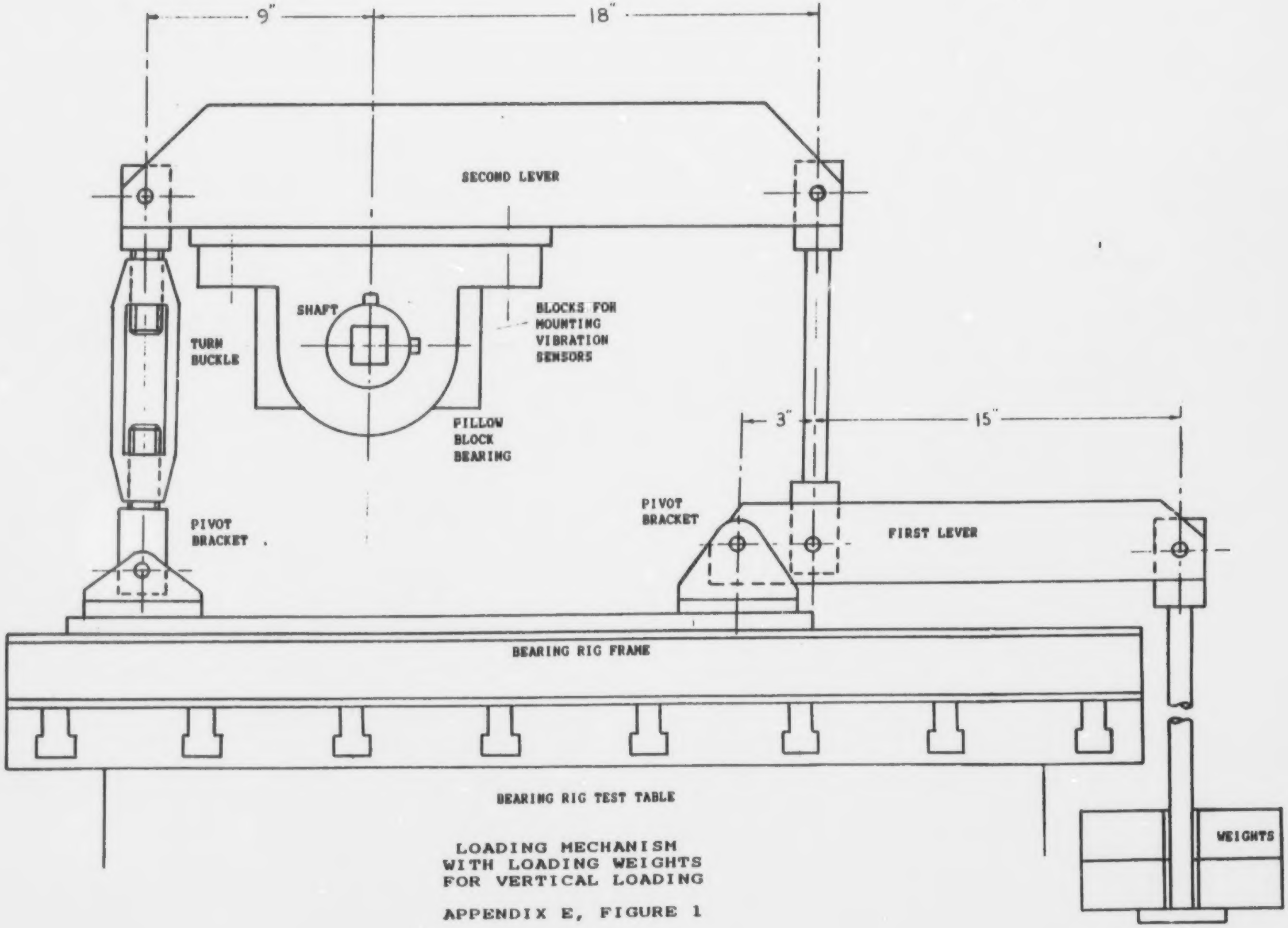
DRAWINGS OF THE LOADING MECHANISM

FIGURE 1 - LOADING MECHANISM WITH LOADING WEIGHTS FOR VERTICAL LOADING

FIGURE 2 - LOADING MECHANISM WITH LOADING WEIGHTS AND PNEUMATIC RAM FOR VERTICAL LOADING

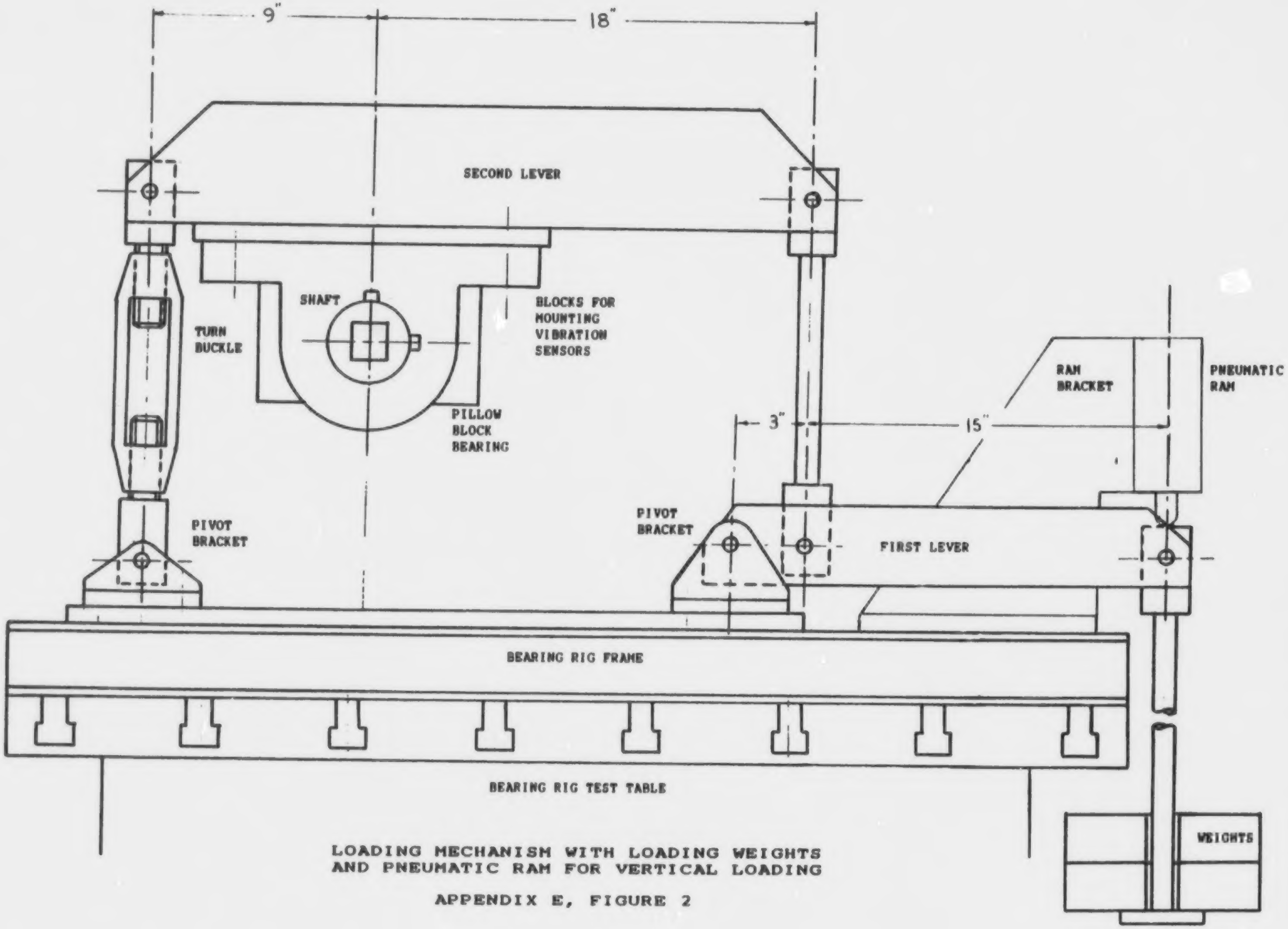
FIGURE 3 - LOADING MECHANISM WITH SPRING FOR VERTICAL LOADING AND PNEUMATIC RAM FOR LATERAL LOADING

FIGURE 4 - LOADING MECHANISM FORCE GENERATING SYSTEM FOR PNEUMATIC RAM


9"
18"
SECOND LEVER
SHAFT
BLOCKS FOR MOUNTING VIBRATION SENSORS
TURN BUCKLE
PILLOW BLOCK BEARING
3"
15"
PIVOT BRACKET
PIVOT BRACKET
FIRST LEVER
BEARING RIG FRAME
BEARING RIG TEST TABLE
WEIGHTS

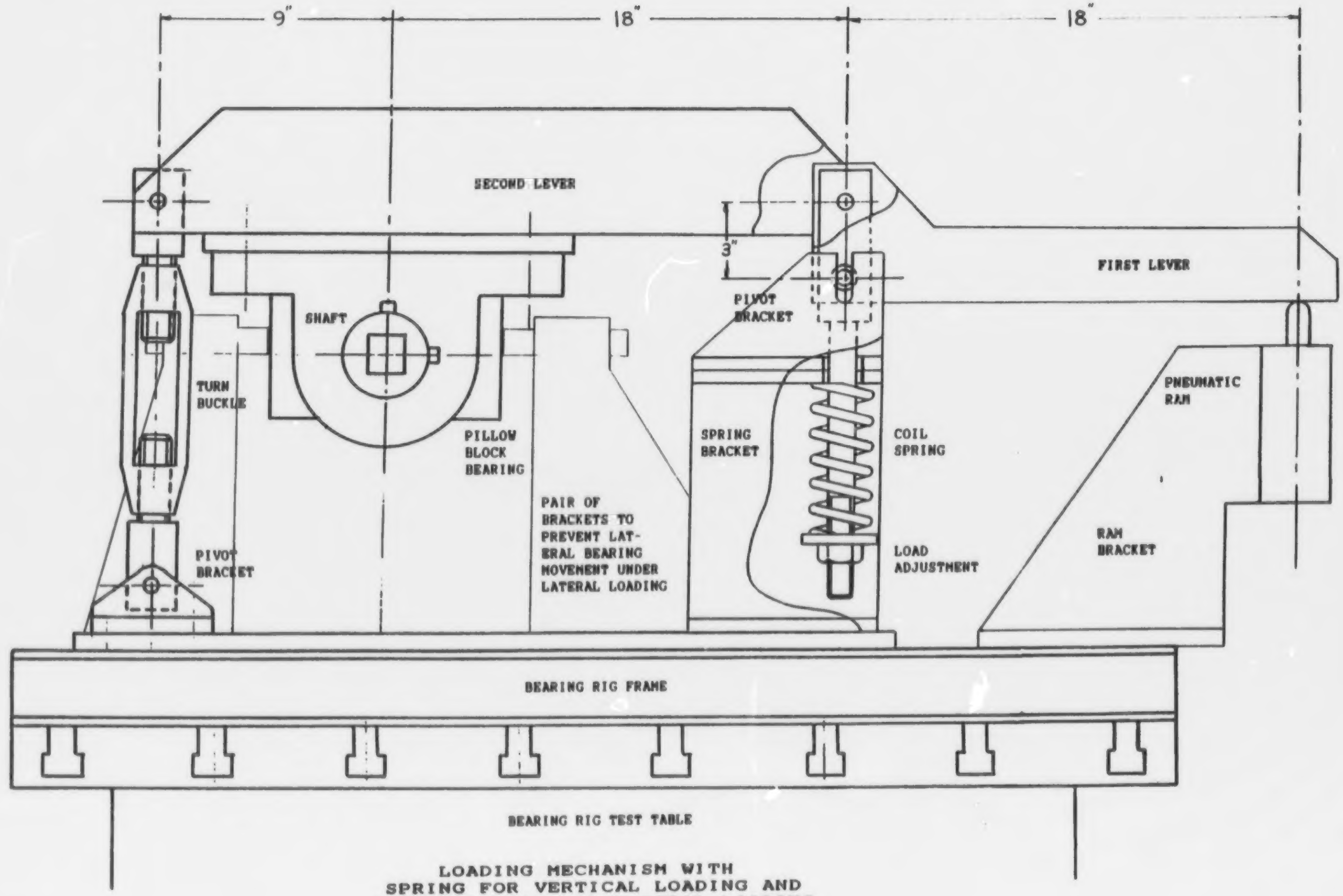
LOADING MECHANISM
WITH LOADING WEIGHTS
FOR VERTICAL LOADING

APPENDIX E, FIGURE 1


9"
18"
SECOND LEVER
SHAFT
TURN BUCKLE
BLOCKS FOR MOUNTING VIBRATION SENSORS
PILLOW BLOCK BEARING
RAM BRACKET
PNEUMATIC RAM
3"
15"
PIVOT BRACKET
PIVOT BRACKET
FIRST LEVER
BEARING RIG FRAME
BEARING RIG TEST TABLE
WEIGHTS

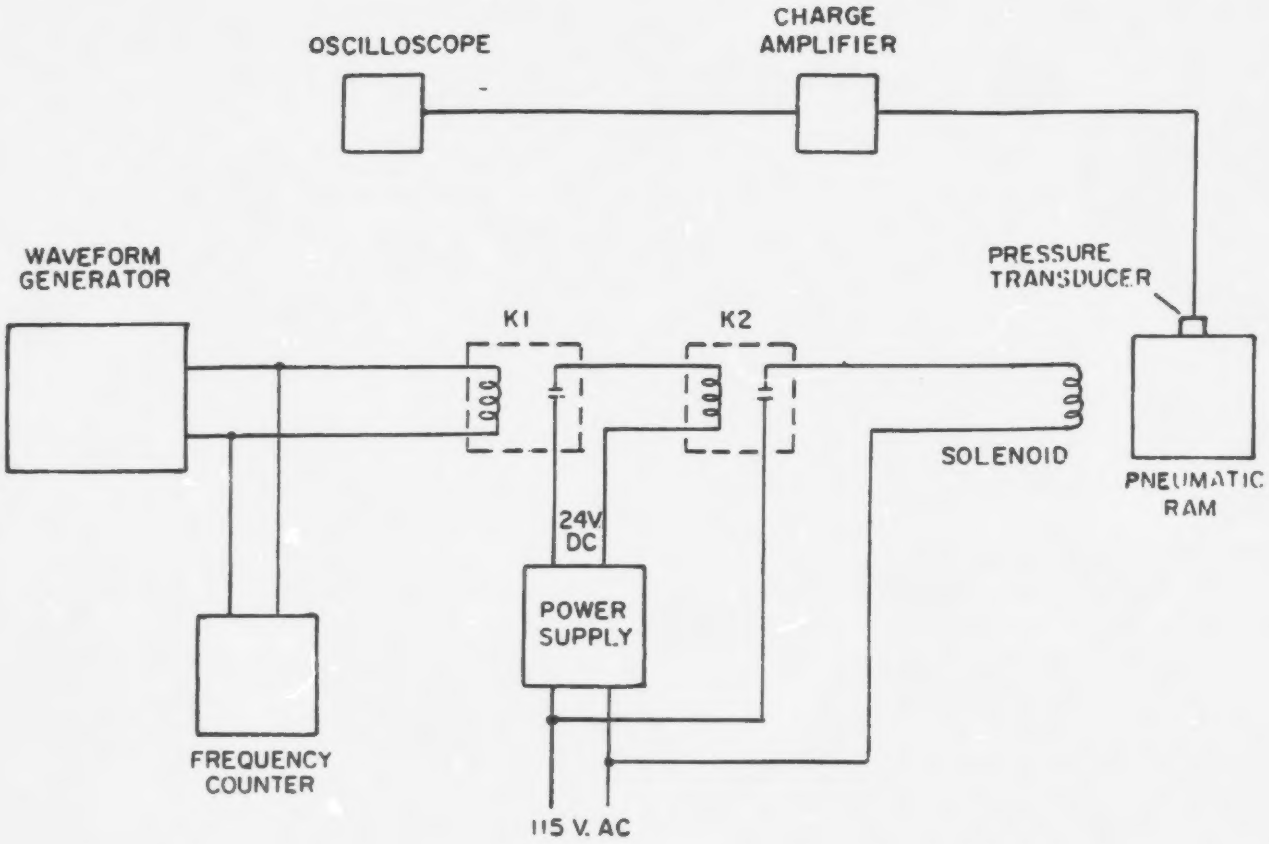
LOADING MECHANISM WITH LOADING WEIGHTS
AND PNEUMATIC RAM FOR VERTICAL LOADING

APPENDIX E, FIGURE 2


9"
18"
18"
SECOND LEVER
FIRST LEVER
3"
PIVOT BRACKET
SHAFT
TURN BUCKLE
PILLOW BLOCK BEARING
SPRING BRACKET
COIL SPRING
PNEUMATIC RAM
PAIR OF BRACKETS TO PREVENT LATERAL BEARING MOVEMENT UNDER LATERAL LOADING
LOAD ADJUSTMENT
RAM BRACKET
PIVOT BRACKET
BEARING RIG FRAME
BEARING RIG TEST TABLE

LOADING MECHANISM WITH
SPRING FOR VERTICAL LOADING AND
PNEUMATIC RAM FOR LATERAL LOADING

APPENDIX E, FIGURE 3


OSCILLOSCOPE
CHARGE AMPLIFIER
WAVEFORM GENERATOR
PRESSURE TRANSDUCER
K1
K2
SOLENOID
PNEUMATIC RAM
24V DC
POWER SUPPLY
FREQUENCY COUNTER
115 V. AC

LIST OF COMPONENTS

1) Wavetek Model 185 Waveform Generator
2) Monsanto Model 104B Frequency Counter
3) NETE Model PS-1 Power Supply
4) Potter and Brumfield Cat. JR1040 Reed Relay, K1
5) Potter and Brumfield Cat. K10P11D15 Relay, K2
6) Asco Cat. Solenoid, 115 V AC
7) Endevco Model 2501 Dynamic Pressure Transducer, 500 psig
8) Endevco Model 2718 Charge Amplifier
9) Tektronic Model 5103N Oscilloscope

APPENDIX E, FIGURE 4

LOADING MECHANISM
FORCE GENERATING SYSTEM FOR PNEUMATIC RAM

APPENDIX F

MONITORING POINTS DATA LOGGER CHANNELS AND MEASUREMENT SYSTEM

APPENDIX F

MONITORING POINTS, DATA LOGGER CHANNELS AND MEASUREMENT SYSTEM

MONITORING POINTS AND DATA LOGGER CHANNELS

The following schematic gives the location of the monitoring points on the test bearing and the test rig. A table gives the data logger channel allocated to each one.

Up to Test Series 10 the individual flows to each recess in the top half bearing were recorded visually. The data logger was introduced from Test Series 13 onwards. As the data logger did not possess enough channels to measure the eight flows individually the connections were changed before Test Series 11 so that four transducers could measure the total flow to each of the four pairs of recesses. The connections that were made and broken to permit this are shown on the schematic.

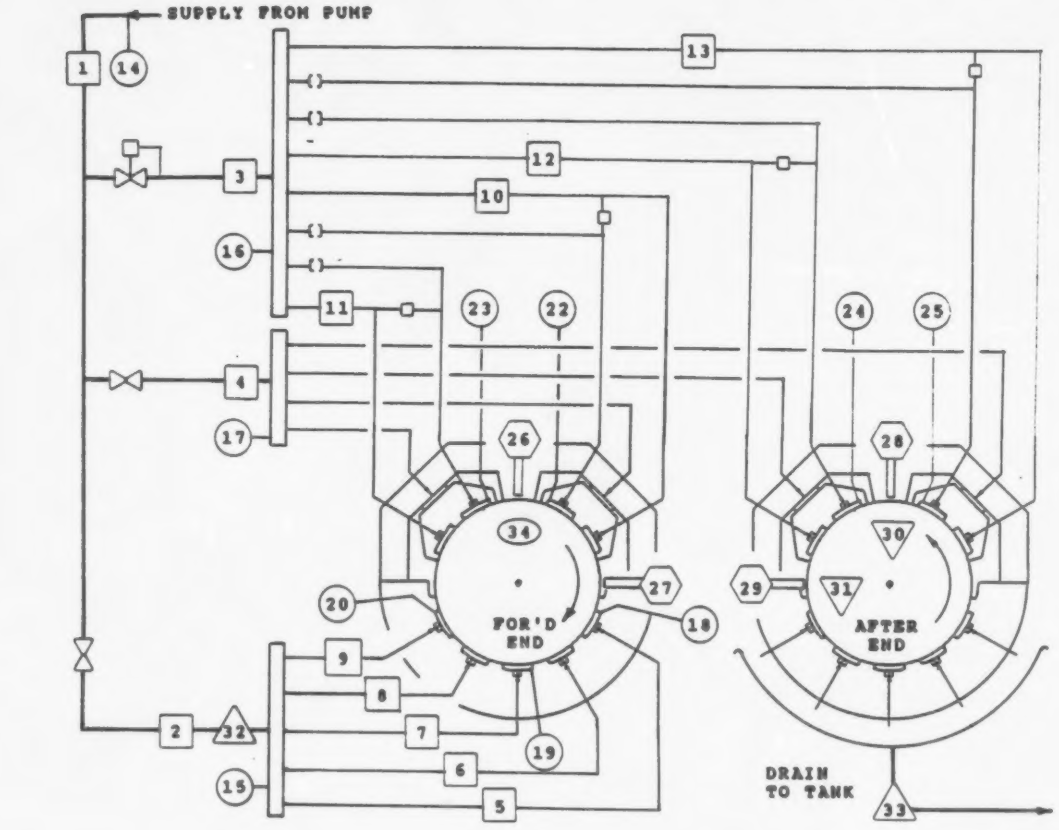
The associated instrumentation is listed herewith. The accuracy of each instrument is detailed in Section 3.6.

QUANTITY	DESCRIPTION
14	Data Instruments model EA0200/AG pressure transducer, 200 psig
8	DeLaval model FT 200, P/N 58712 flowmeter, 0.5 to 5 usgpm
5	DeLaval model FT 200, P/N 58713 flowmeter, 1.0 to 10 usgpm
1	DeLaval model FT 200, P/N 58711 flowmeter, 0.2 to 2 usgpm
2	DeLaval model FT 200, P/N 60426 flowmeter, 3.5 to 35 usgpm
1	NETE-built 14 channel power supply junction box 12 V DC
1	NETE-built 16 channel power supply junction box 24 V DC
1	Non-linear model X-2 digital voltmeter
2	Thermoelectric model J18G304 thermocouples "J" type
1	Doric model 400 A digital temperature indicator, 200 to 933 C
1	Electro Products model 3010 magnetic speed sensor
1	Cox model An 24 turbine flowmeter, 12.5 to 125 usgpm
1	Anadex model CF602R frequency counter
1	Anadex model PI600 frequency/DC converter
4	Bentley Nevada model 21500-04-30-10-02 displacement probes
4	Bentley Nevada model 18745-02 proximators
4	Bentley Nevada model 21747-080-00 extension cables
1	Tektronic model 5103N oscilloscope
2	Bruel and Kjaer type 4371 accelerometer
1	NETE-built 4 channel attenuator
6	Endevco model 2735 vibration amplifier
1	Fluke model 2240C data logger

DATA LOGGER MEASUREMENT SYSTEM

The location of the above-listed instruments in the measurement system is shown in the second schematic of this Appendix.

APPENDIX F. DATA LOGGER MONITORING POINTS



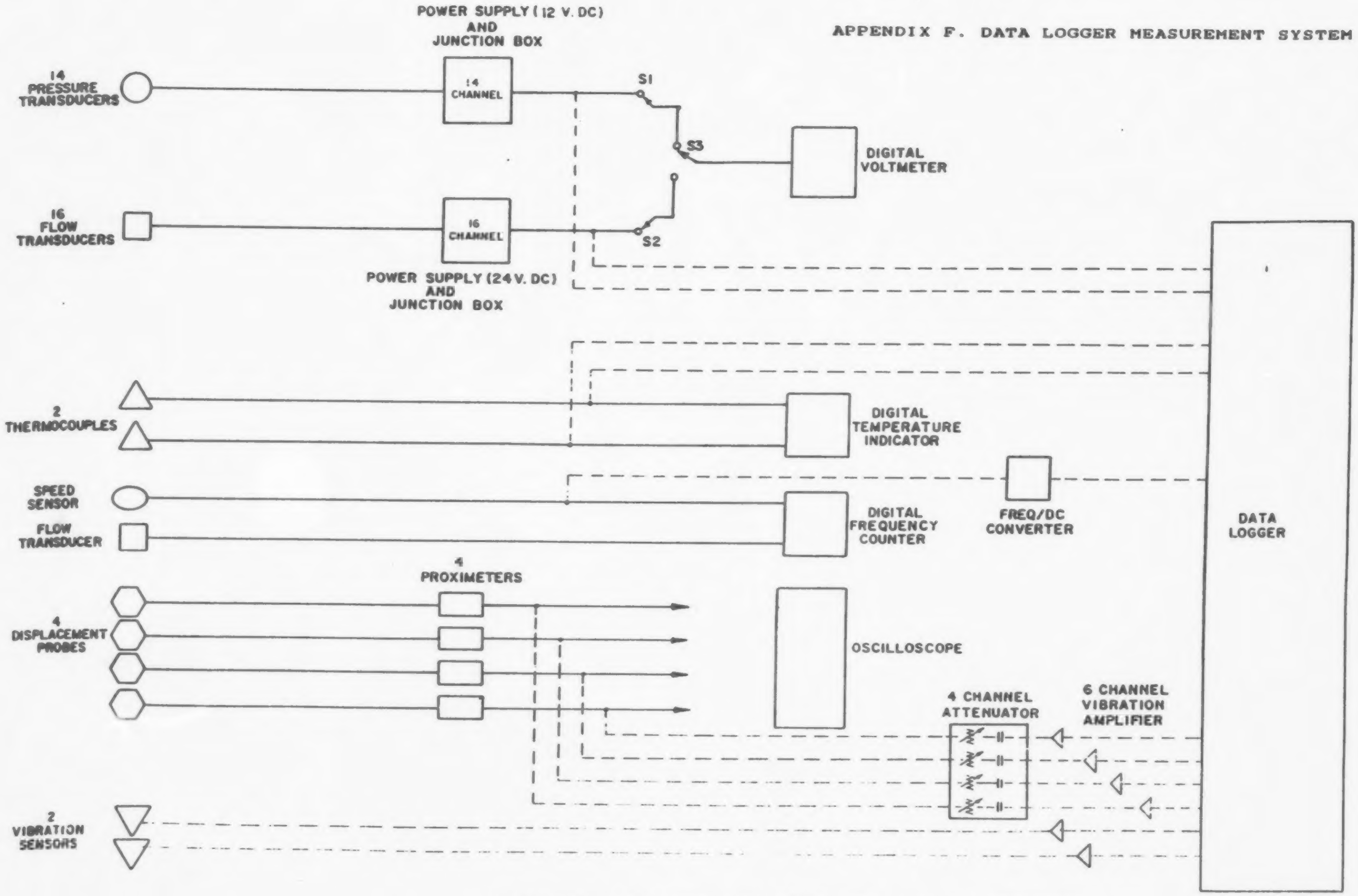
LEGEND

□	Flow transducer
○	Pressure transducer
⬡	Proximity probe
▽	Vibration sensor
△	Thermo-couple
⬭	Speed sensor
—□—	Connection made
—()—	Connection broken

ALLOCATION OF DATA LOGGER CHANNELS

PARAMETER	UNITS	LOCATION OF MEASURING INSTRUMENT	DATA LOGGER CHANNEL No.
Flow	igpm	Cox Flow Meter. Logger channel not connected.	1
Flow	igpm	Manifold supplying bottom half bearing recesses	2
Flow	igpm	Manifold supplying top half bearing recesses	3
Flow	igpm	Manifold supplying pistons	4
Flow	igpm	Supply to the two port outer recesses, bottom half bearing	5
Flow	igpm	Supply to the two port inner recesses, bottom half bearing	6
Flow	igpm	Supply to the two centre recesses, bottom half bearing	7
Flow	igpm	Supply to the two stbd inner recesses, bottom half bearing	8
Flow	igpm	Supply to the two stbd outer recesses, bottom half bearing	9
Flow	igpm	Supply to the for'd port outer recess, top half bearing	10
Flow	igpm	Supply to the for'd stbd outer recess, top half bearing	11
Flow	igpm	Supply to the after port outer recess, top half bearing	12
Flow	igpm	Supply to the after stbd outer recess, top half bearing	13
Pressure	psig	In the supply from the pump	14
Pressure	psig	In the manifold supplying the bottom half bearing recesses	15
Pressure	psig	In the manifold supplying the top half bearing recesses	16
Pressure	psig	In the manifold supplying the pistons	17
Pressure	psig	In the for'd port outer recess, bottom half bearing	18
Pressure	psig	In the for'd centre recess, bottom half bearing	19
Pressure	psig	In the for'd stbd outer recess, bottom half bearing	20
		Channel not used	21
Pressure	psig	In the for'd port inner recess, top half bearing	22
Pressure	psig	In the for'd stbd inner recess, top half bearing	23
Pressure	psig	In the after port inner recess, top half bearing	24
Pressure	psig	In the after stbd inner recess, top half bearing	25
Clearance	inch	Vertical displacement of shaft in bearing, for'd probe	26
Clearance	inch	Lateral displacement of shaft in bearing, for'd probe	27
Clearance	inch	Vertical displacement of shaft in bearing, after probe	28
Clearance	inch	Lateral displacement of shaft in bearing, after probe	29
Vibration	"g"	RMS values of vertical amplitudes of load-applying bearing	30
Vibration	"g"	RMS values of lateral amplitudes of load-applying bearing	31
Temp	deg C	Manifold supplying bottom half bearing recesses	32
Temp	deg C	Drain from bearing to tank	33
Speed	rpm	Shaft speed	34

APPENDIX F. DATA LOGGER MEASUREMENT SYSTEM


POWER SUPPLY (12 V. DC) AND JUNCTION BOX
14 PRESSURE TRANSDUCERS
14 CHANNEL
S1
S3
DIGITAL VOLTMETER
16 FLOW TRANSDUCERS
16 CHANNEL
S2
POWER SUPPLY (24 V. DC) AND JUNCTION BOX
2 THERMOCOUPLES
DIGITAL TEMPERATURE INDICATOR
SPEED SENSOR
FLOW TRANSDUCER
DIGITAL FREQUENCY COUNTER
FREQ/DC CONVERTER
DATA LOGGER
4 PROXIMETERS
4 DISPLACEMENT PROBES
OSCILLOSCOPE
4 CHANNEL ATTENUATOR
6 CHANNEL VIBRATION AMPLIFIER
2 VIBRATION SENSORS

NOTE BROKEN LINES SHOW DATA LOGGER INPUT SIGNAL CONDITIONERS.

APPENDIX G

EQUIPMENT AND INSTRUMENTATION LIST

APPENDIX G

EQUIPMENT AND INSTRUMENTATION LIST

NO.	DESCRIPTION	SPECIFICATION OR EQUIVALENT	IDENTIFICATION
1	One hydrostatic model stern tube bearing 6.5 inch diameter	Upper and lower bronze casting. Material to conform to UNS No. No.C86300 and ASTM B58477. Bearing configuration to NETE Dwgs Nos D-1341/1342. (Ref. Dwg. TDC 813-5003, Sheet 1 of 2). Design pressure 200 psig	Castings: USP Industries Inc. Lennoxville, Quebec. Machining: Harrington Div. Ingersoll-Rand, Lachine, Quebec
2	One hydrostatic model stern tube shaft 6.5 inches diameter	Shaft 6.5" dia, 66.5" nominal length. Material to AISI 4140 cold rolled steel. Partial metallizing with METCO 442 surface cladding. Shaft configuration to NETE Dwg. No. D-1355 (Ref. Dwg. TDC 813-5003 sheet 2 of 2.	Supplier: Drummond McCall Inc. Montreal, Quebec. Machining: Peacock Inc. Lasalle, Que.
3	Two pillow blocks for stern tube shaft	One pillow block bearing SNCO 22518 303E for 3" shaft. One pillow block bearing SNCO 22515 207E for 2 7/16" shaft	Supplier: SKF Canada Ltd. Montreal, Que.
4	One variable speed electric motor	10 hp DC motor. Variable speed 850-2500 rpm. 240 Volts 37 Amps	Supplier: Naval Engineering Test Establishment, LaSalle, Que.
5	Two pulleys One belt One belt tightener	One pulley 60 x HR 200 One pulley 30 x HR 200 One belt One belt tightener ATQ No.3 shaft	Supplier: L.H. Tarshis and Sons Ltd. Montreal, Que.
6	One bearing loading mechanism	In-house manufacture of bearing loading mechanism and weights to Dwg. TDC 813-5003 Sheet 2 of 2	Manufacturer: Naval Engineering Test Establishment

NO.	DESCRIPTION	SPECIFICATION OR EQUIVALENT	IDENTIFICATION
7	One bearing rig test table	One cast steel slotted table size 40" x 60" CDN L-51A 10 FE-1173. Miscellaneous locating and securing components to suit installation on table	Supplier: Naval Engineering Test Establishment Manufacturer: Naval Engineering Test Establishment
8	High pressure pump and motor assembly	One sea water corrosion resistant pump, capacity 100 igpm, pressure 200 psig. One 1 1/2" throttle valve, gauge and bypass safety orifice and piping. One base plate with associated drive components One 75 hp motor 3600 rpm	Pump: KOBE model RGB 150 Motor: BBC-40hp-3/60/575-TEFC 1750 rpm, S.F. 1.0 Supplier: Affiliated Eng. Equipment Ltd. Montreal, Que.
9	One heat exchanger	Sea water corrosion resistant heat exchanger to cool 100 igpm of sea water from 90 to 70 deg.F with 120 igpm city water at 50 deg.F (outlet 66 deg.F) Heat load 1,200,000 Btu/h. Tubes 90/10 cupro-nickel. Heads SS 316. Design pressure 200 psig. 2" dia. connections	Heat exchnger: American Standard model C200 size 08-108 Supplier: Affiliated Eng. Equipment Ltd. Montreal, Que.
10	One filter	Sea water corrosion resistant filter. Housing SS 316. Flow 100 igpm. Pressure 200 psig. Initial press. diff. 2 psi. 2" dia. connections. Nominal 10 micron rating	Filter: PALL model LCL3010 G32LP Supplier: PALL (Canada) Ltd. Montreal, Que.
11	Miscellaneous conduits, fittings orifices, gauges gate valves and pressure reducing valves	Sea water corrosion resistant components of SS316 high pressure type	Conduits and Fittings: Atlas Alloys, Pointe Claire, Que. Valves and Gauges, Marceau Industrie Ltee. Montreal, Que.

NO.	DESCRIPTION	SPECIFICATION OR EQUIVALENT	IDENTIFICATION
12	One supply tank with modifications	One sea water corrosion resistant tank in SS 316, capacity 300 imp.gal.	Supplier: Naval Engineering Test Establishment
		Polyethylene low pressure conduits and fittings	Supplier: Les Plastiques Miller Ltee. Dorval, Que.
13	Instrumentation package	14 pressure transducers for sea water. Range up to 1000 psig	Pressure Transducers: Data Instruments model EAO-200/AG
		16 flow transducers for sea water. Range 1.2 to 12 igpm	Flow Transducers: GEMST series FT-200 P/N 58711/58712/58713
			Supplier: Delaval Turbine Canada Ltd. Montreal, Que.
		One turbine type flowmeter. Range 10 to 100 igpm	Flowmeter: COX model AN-24.
			Supplier: Brian Engineering Ltd. Montreal, Que.
		One multiplexer-demultiplexer capable of recording signals from 30 transducers simultaneously	Multiplexers: 2 Sangamo type MA 1142/0
			Filters: 32 Sangamo type MA 5221/3, 125 Hz
			Demultiplexer: 32 Sangamo type MA 5225/3
			Storage cards
			Supplier: Allan Crawford Assoc. Ltd. Mississauga, Ont.

NO.	DESCRIPTION	SPECIFICATION OR EQUIVALENT	IDENTIFICATION
14	One sea water collecting tank. Miscellaneous adapters, conduits, fittings	Sea water resistant tank of polyethylene, capacity 75 imp.gal.	Supplier: Roy Gillings Agencies Inc. Beaconsfield, Que.
15	One low pressure pump and motor assembly	One sea water corrosion resistant pump, capacity 80 igpm, pressure 30 psig	Pump: BIG FLO Industrial pump model 10914 1.5" Motor: Power Bloc Leroy Somer 3 hp, 3450 rpm
		One base plate with associated drive components and 3 hp motor, 3450 rpm	Supplier: EMACO (Canada) Ltd. Montreal, Que.
16	One high pressure regenerative turbine pump and motor assembly	One sea water corrosion resistant pump. Capacity 30 igpm, pressure 150 psig, 1750 rpm	Pump: PACO Turboflex model 162D (two-stage) and associated components
		One base plate with associated drive components	Supplier: PLAD Equipment Cie. St. Laurent, Que.
		One 15 hp motor	Supplier: Naval Engineering Test Establishment.
17	One data logger	One data logger capable of scanning and recording 3 separate measurements per second from 37 monitoring points on a hard copy	Fluke Data Logger model 2240C Supplier: Genstar Rental Electronics Inc. Toronto, Ont.
18	Three miscellaneous items	(A) Manufacturing of components for incorporating mechanical/pneumatic/electrical vibratory equipment to the test rig (B) Modification and adaption of in-house impulse generator components to suit electrical vibratory equipment	Supplier: Naval Engineering Test Establishment

NO.	DESCRIPTION	SPECIFICATION OR EQUIVALENT	IDENTIFICATION
		(C) Modification of lower hydrostatic bearing for enhanced load carrying capability and reduced flow	

APPENDIX H

PHOTOGRAPHS

APPENDIX H

PHOTOGRAPHS

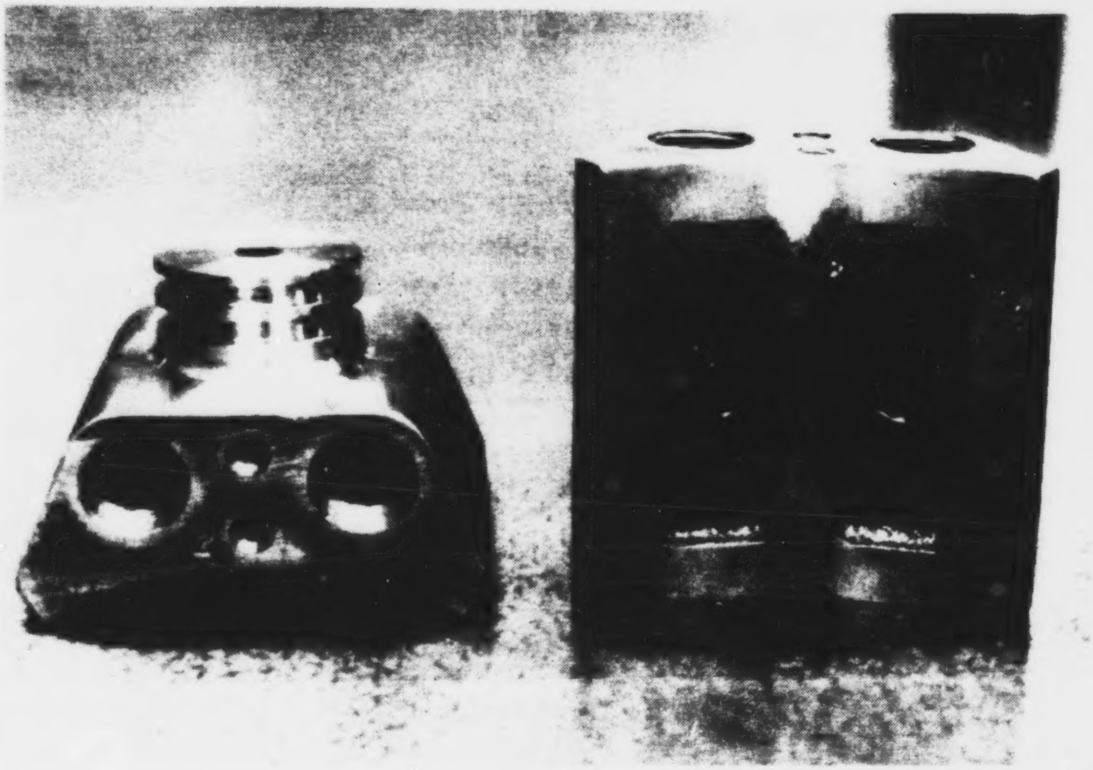
PHOTOGRAPH NUMBER	CAPTION
NE 275/82	The assembled stern tube bearing showing recesses in the bottom half and bearing pads in the top half. Water supply connections to two of the pistons can be seen.
NE 73/84	An upper bearing pad showing, on the left, details of the piston and, on the right, details of the recesses. The orifices are clearly seen screwed into the recess supply channels.
NE 74/84	The lower half bearing showing pressure tappings to the centre and outer recesses. The arrows point to the ends of the central annulus and show where they were sealed before Test Series 10.
NE 75/84	The upper half bearing showing water supply and pressure transducer connections to the pad recesses.
NE 273/82	The stern tube bearing installed in the test rig. The trunnion mounting, which permits the bearing to pivot, can be seen at the centre bottom of the photograph.
NE 76/84	A general arrangement of the compound lever mechanism erected for the application of a steady vertical load by means of weights.
NE 274/82	A general view of the test bay showing the front of the test rig. To the right is the KOBE pump.
NE 404/83	A general view of the rear of the test rig showing the pneumatic ram set up to apply lateral loads and the coil spring applying vertical load. One of the two brackets preventing lateral movement of the bearing can be seen. The PACO pump is seen to the right of the table.
NE 401/83	A general view of the data monitoring system showing, on the left, the console for manual data collecting and, on the right, the console for automated data collecting with a FLUKE model 2240C Data Logger.

APPENDIX H

The assembled stern tube bearing showing recesses in the bottom half and bearing pads in the top half. Water supply connections to two of the pistons can be seen.

NAVAL ENGINEERING TEST ESTABLISHMENT PHOTOGRAPH NE 275/82

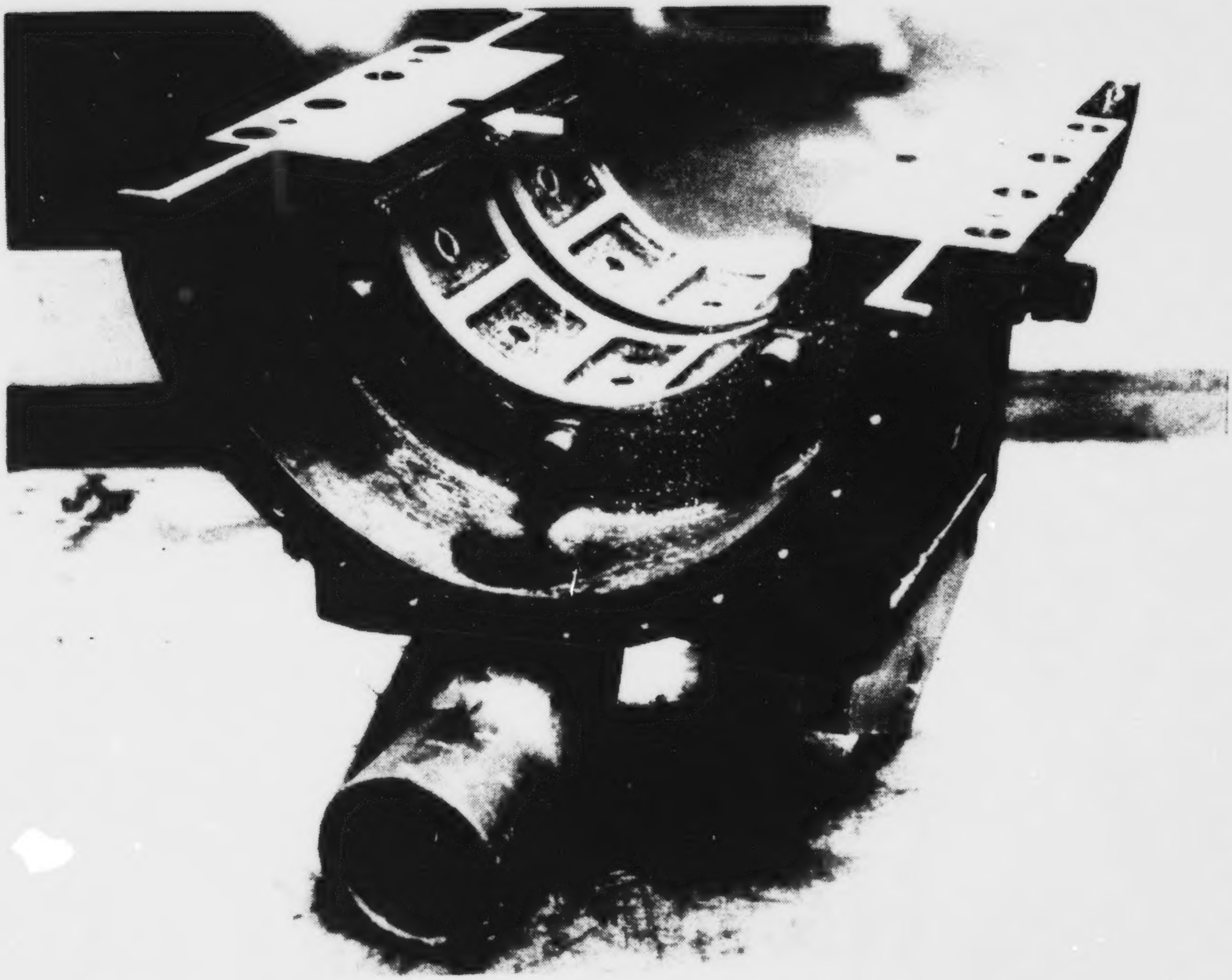
APPENDIX H



An upper bearing pad showing, on the left, details of the piston and, on the right, details of the recesses. The orifices are clearly seen screwed into the recess supply channels.

NAVAL ENGINEERING TEST ESTABLISHMENT PHOTOGRAPH NE 73/84

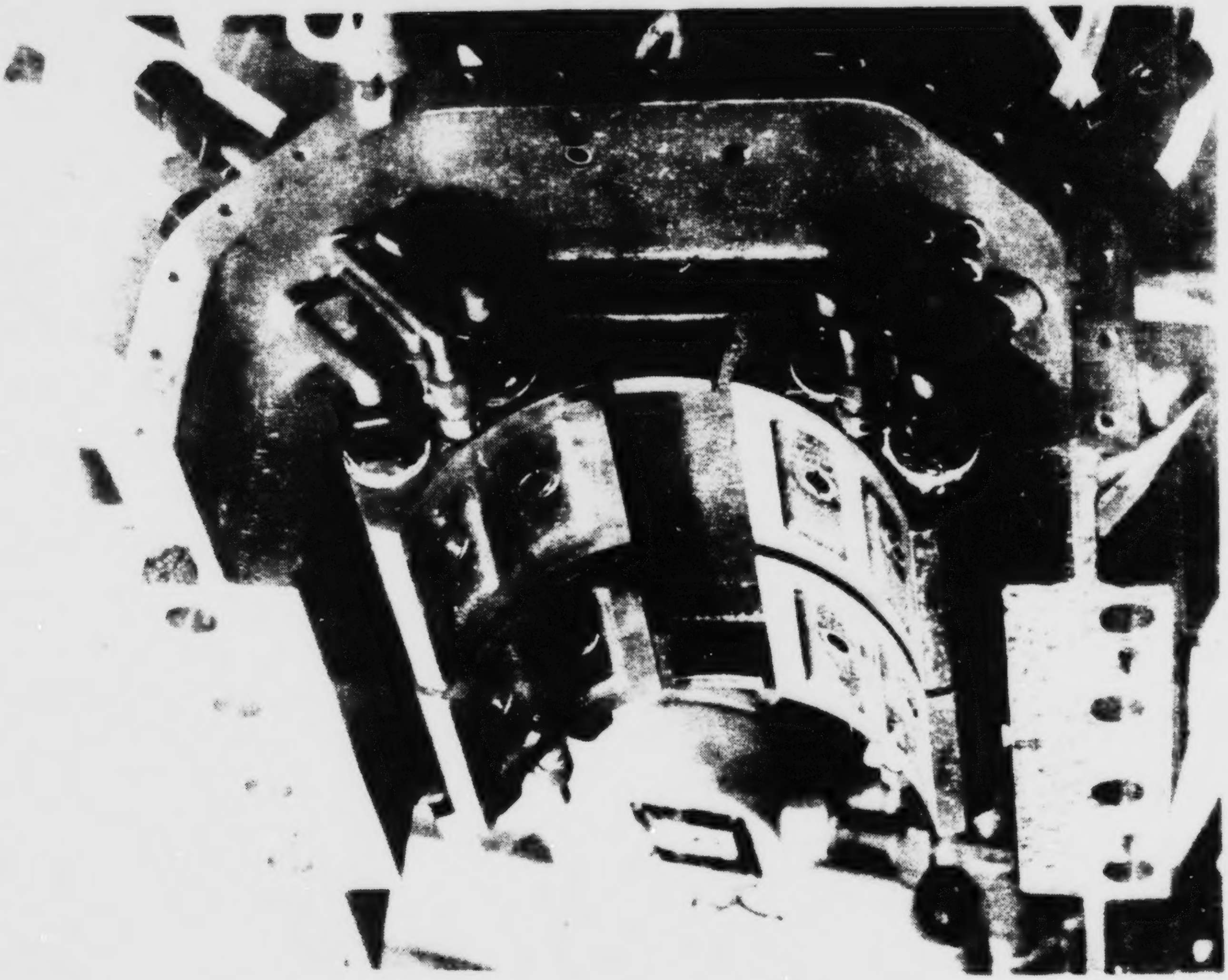
APPENDIX H



The lower half bearing showing pressure tappings to the centre and outer recesses. The arrows point to the ends of the central annulus and show where they were sealed before Test Series 10.

NAVAL ENGINEERING TEST ESTABLISHMENT PHOTOGRAPH NE 74/84

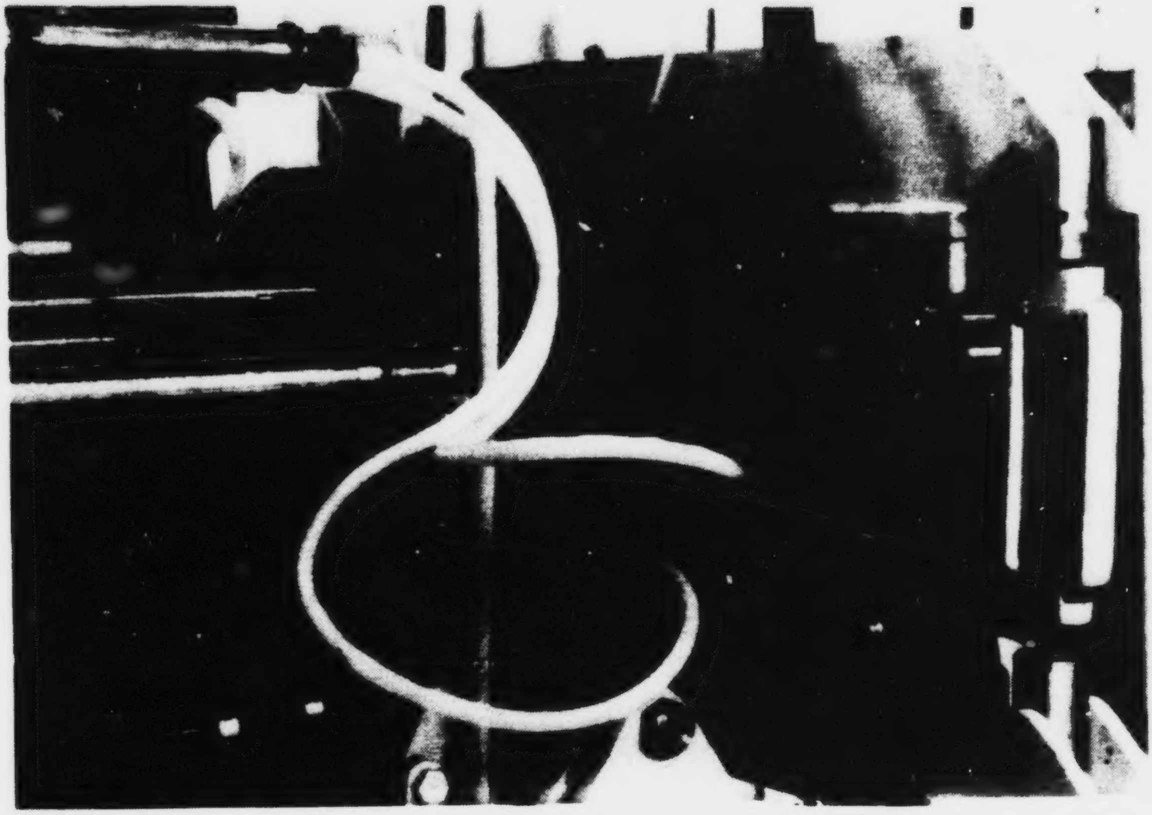
APPENDIX H



The upper half bearing showing water supply and pressure transducer connections to the pad recesses.

NAVAL ENGINEERING TEST ESTABLISHMENT PHOTOGRAPH NE 75/84

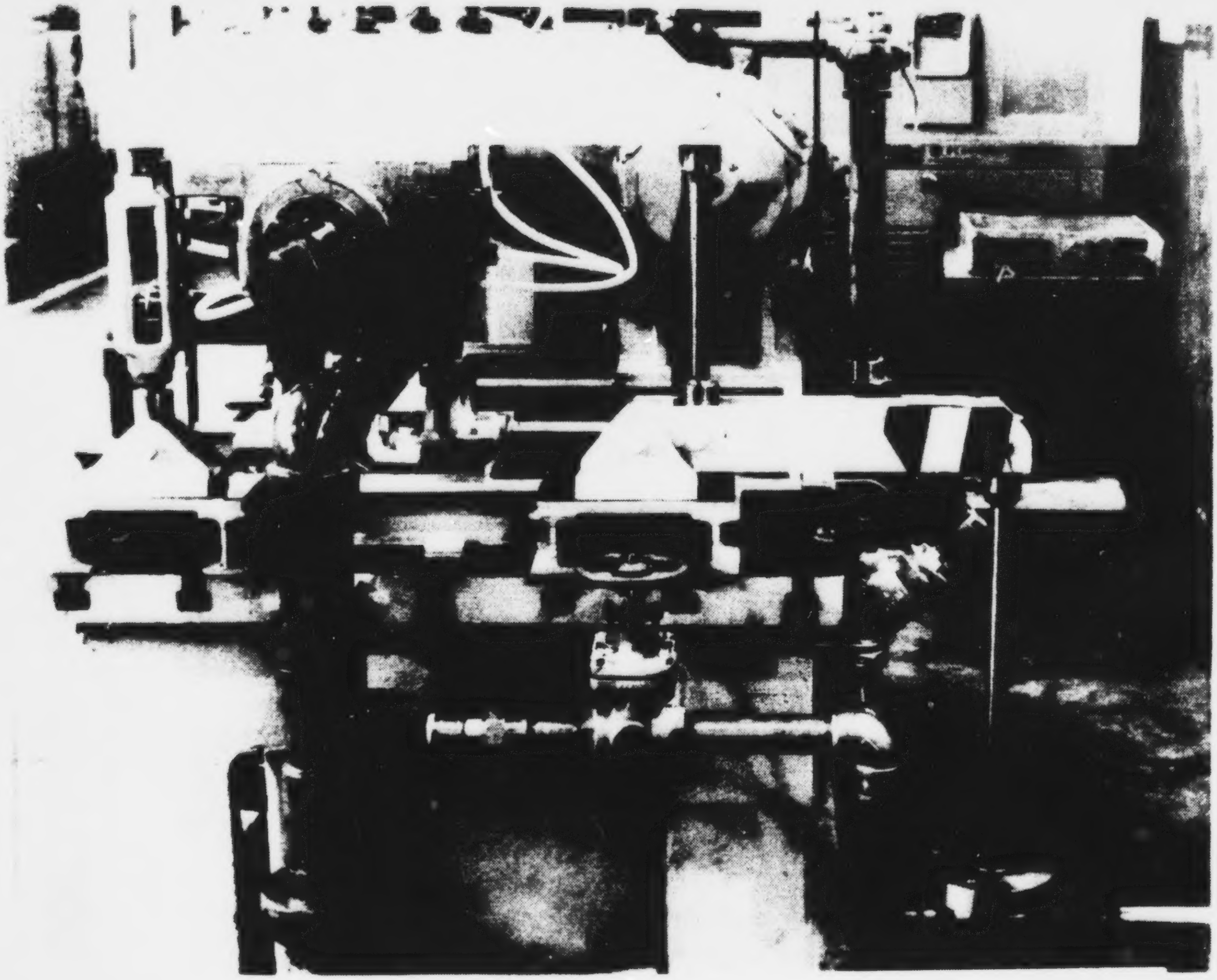
APPENDIX H



The stern tube bearing installed in the test rig. The trunnion mounting, which permits the bearing to pivot, can be seen at the centre bottom of the photograph.

NAVAL ENGINEERING TEST ESTABLISHMENT PHOTOGRAPH NE 273/82

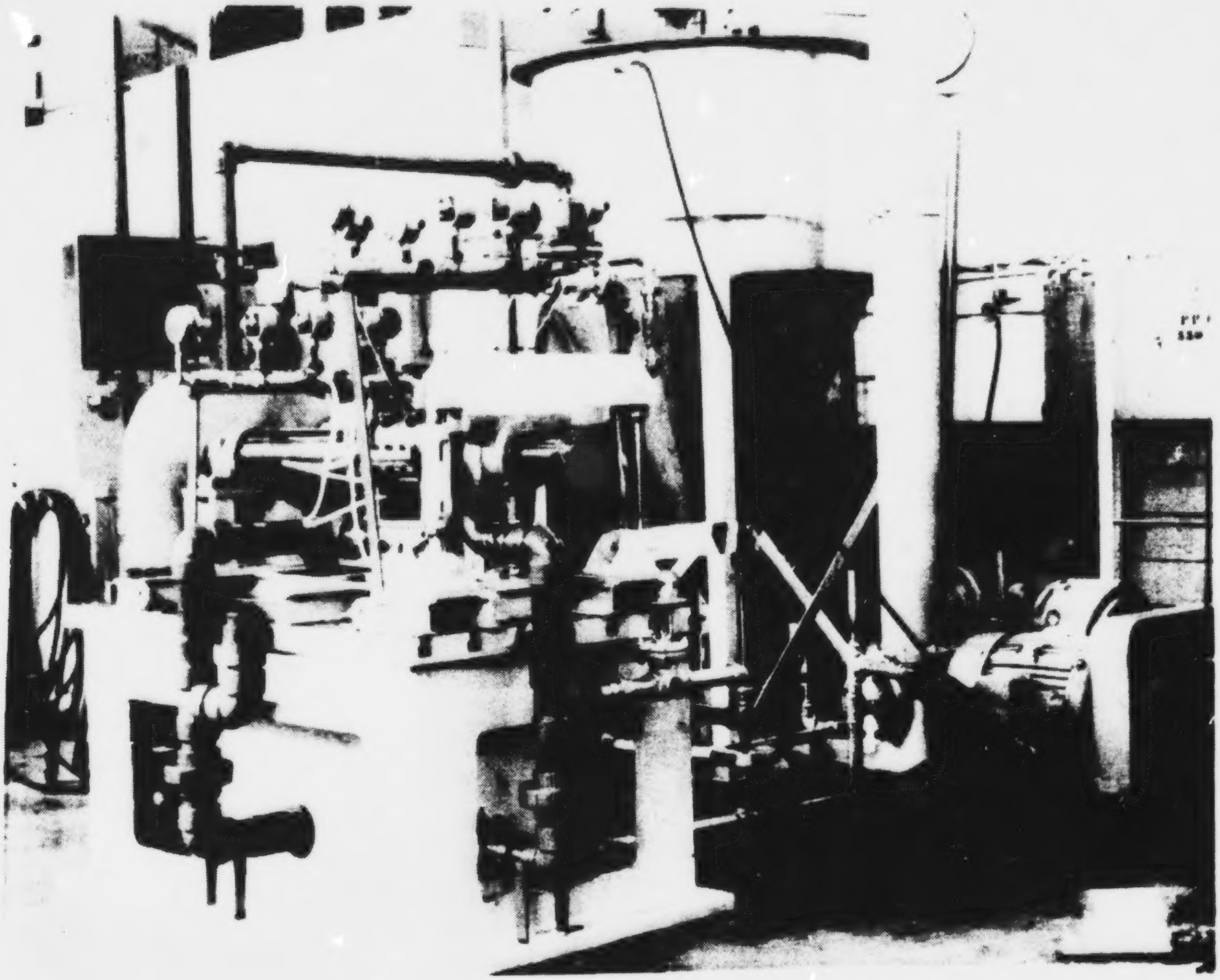
APPENDIX H



A general arrangement of the compound lever mechanism erected for the application of a steady vertical load by means of weights.

NAVAL ENGINEERING TEST ESTABLISHMENT PHOTOGRAPH NE 76/84

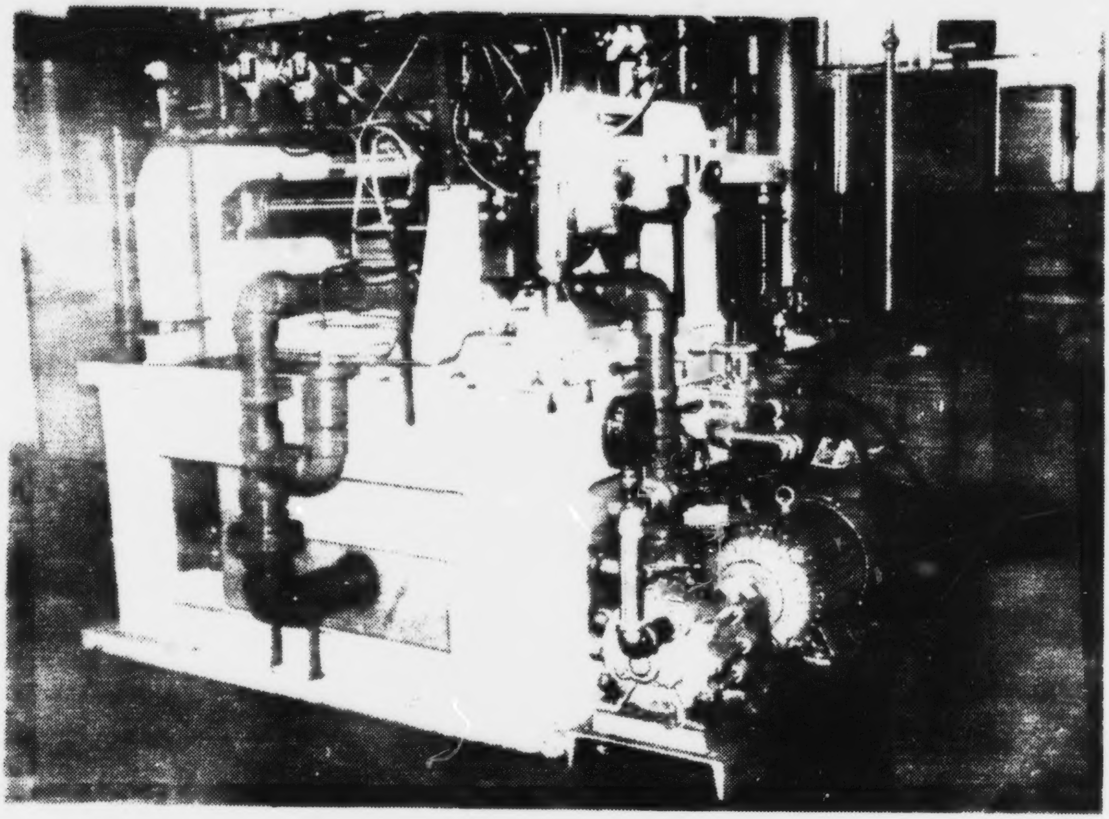
APPENDIX H



A general view of the test bay showing the front of the test rig. To the right is the KOBE pump.

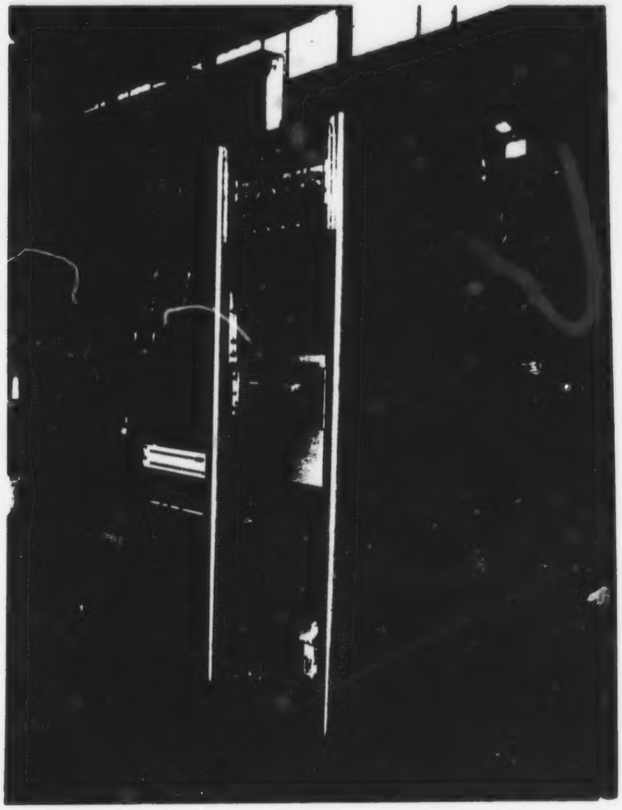
NAVAL ENGINEERING TEST ESTABLISHMENT PHOTOGRAPH NE 274/82

APPENDIX H



A general view of the rear of the test rig showing the pneumatic ram set up to apply lateral loads and the coil spring applying vertical load. One of the two brackets preventing lateral movement of the bearing can be seen. The PACO pump is seen to the right of the table.

APPENDIX H



A general view of the data monitoring system showing, on the left, the console for manual data collecting and, on the right, the console for automated data collecting with a FLUKE model 2240C Data Logger.

NAVAL ENGINEERING TEST ESTABLISHMENT PHOTOGRAPH NE 401/83

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Volume

2

TP 7418E

EVALUATION OF A 6.5 INCH DIA. MODEL HYDROSTATIC STERN TUBE BEARING

Prepared for the
TRANSPORTATION DEVELOPMENT CENTRE
TRANSPORT CANADA, MONTREAL, QUEBEC
by E. Meindersma, B.Sc.

VOLUME II

NAVAL ENGINEERING TEST ESTABLISHMENT
LASALLE, QUEBEC
REPORT NO. 70/87
21 December 1987

The contents of this report reflect the views of the author and not necessarily the official view or opinions of the Transportation Development Centre of Transport Canada.

Un sommaire en français de ce rapport est inclus avant la Table des matières.

Transport Canada Transports Canada
Development Développement

REPORT DOCUMENTATION FORM

1 Transport Canada Report No **TP 7418E**	2 TDC Project No 4474	3 Recipient's Catalogue No

4 Title and Subtitle **Evaluation of a 6.5 Inch Diameter Model Hydrostatic Stern Tube Bearing**	5 Report Date December 21, 1987 6 Performing Organization Report No 67/87
7 Author(s) **E. Meindersma, B.Sc.**	8 Transport Canada File No D1460-162-1
9 Performing Organization Name and Address Naval Engineering Test Establishment 161 Wanklyn Street LaSalle, Quebec H8R 1Z2	10 DSS File No 15MJ.T8200-1-1530 11 DSS or Transport Canada Contract No OMJ81-01642
12 Sponsoring Agency Name and Address Transportation Development Centre (TDC) 200 Dorchester Blvd. West Suite 601, West Tower Montreal, Quebec H2Z 1X4	13 Type of Report and Period Covered Final 14 Sponsoring Agency Code
15 Supplementary Notes Volume I: Main Report Volume II: Test Data Tables	16 TDC Project Officer **R.H.F. Dillon,** **N.R. Gore**

17 Abstract

An evaluation of a 6.5" dia. X 7.5" long hydrostatic bearing is presented, based on a test program conducted at the Naval Engineering Test Establishment, LaSalle, Quebec. A complete record of test data is provided. The bearing was designed to model in one-fifth scale the peripheral shaft velocities, pressures and shaft/bearing clearance conditions that would apply for a stern bearing intended for large tonnage marine carriers. Test data is included for two variations of the bearing: the original design and a modification to this design that reduced the water escape area, thereby increasing the effective support area.

A graphical presentation of the load/pressure/flow/displacement characteristics of the modified bearing under applied loads from 1,000 to 8,000 lb. is included.

18. Key Words Hydrostatic Bearing, Stern (Tube) Bearing, Externally Pressurized Bearing	19. Distribution Statement Limited number of copies available from the Transportation Development Centre.

20 Security Classification (of this report) Unclassified	21. Security Classification (of this page) Unclassified	22. No. of Pages Volume I 190 Volume II 174	23. Price ---

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16. Agent de projet — CDT
R.H.F. Dillon,
N.R. Gore

17 Résumé

Ce rapport présente l'évaluation d'un palier hydrostatique ayant un diamètre de 6,5 po et une longueur de 7,5 po, au terme d'un programme d'essais réalisé au Centre d'essais techniques (Mer) de LaSalle, Québec, et dont tous les résultats sont fournis. Le palier a été réalisé afin d'étudier à l'échelle un cinquième les paramètres de fonctionnement - vitesse périphérique de l'arbre, pression et jeu radial - des paliers de tube d'étambot devant équiper les navires de fort tonnage. Les données d'essais concernent deux variantes du palier, c'est-à-dire le modèle original et une version modifiée pour réduire la surface de fuite du lubrifiant utilisé et ainsi augmenter la portée efficace du palier.

Un graphique est présenté mettant en relation les caractéristiques de portance, de pression, de débit et de résistance du palier modifié, sous une gamme de charges allant de 1 000 à 8 000 livres.

18. Mots-clés
Palier hydrostatique, palier de tube d'étambot, palier à source de mise en pression extérieure

19. Diffusion
Le Centre de développement des transports dispose d'un nombre limité d'exemplaires.

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LIST OF TABLES

VOLUME II
Page

Table 0.1 Summary of Conditions Imposed During Each Series of Tests 1

Table 1.0 Conditions for Test Series 1
PRELIMINARY TESTS, PISTONS REMOVED FROM TOP HALF 3
Table 1.1 Results of Tests 34A to 34G 4
Table 1.2 Results of Tests 35A to 35G 5
Table 1.3 Results of Tests 36A to 36G 6
Table 1.4 Results of Tests 37A to 37G 7
Table 1.5 Results of Tests 38A to 38G 8
Table 1.6 Results of Tests 39A to 39G 9
Table 1.7 Summary of Results from Tables 1.1 to 1.6 10

Table 2.0 Conditions for Test Series 2
RATED LOAD, INCREASING SPEED, NO ORIFICES 11
Table 2.1 Results of Tests 2A to 2G 12

Table 3.0 Conditions for Test Series 3
RATED LOAD, INCREASING SPEED, ORIFICES 14
Table 3.1 Results of Tests 3A to 3G 15

Table 4.0 Conditions for Test Series 4
RATED LOAD, INCREASING SPEED, COLD AND WARM SEA WATER 17
Table 4.1 Results of Tests 4AA to 4AG 18
Table 4.2 Results of Tests 4BA to 4BF 20

Table 5.0 Conditions for Test Series 5
INCREASING OVERLOAD, NO ORIFICES, SHAFT STOPPED 22
Table 5.1 Results of Tests 5A to 5G 23

Table 6.0 Conditions for Test Series 6
OVERLOAD, ORIFICES, SEA WATER, SHAFT STOPPED 25
Table 6.1 Results of Tests 6A to 6K 26

Table 7.0 Conditions for Test Series 7
INCREASING OVERLOAD. ORIFICES, CONSTANT SPEED 29
Table 7.1 Results of Tests 7A to 7F 30

Table 8.0 Conditions for Test Series 8
INCREASING OVERLOAD, SHAFT STOPPED, PACO PUMP 32
Table 8.1 Results of Tests 8AA to 8AM 33
Table 8.2 Results of Tests 8BA to 8BG 37

Table 9.0 Conditions for Test Series 9
CONSTANT OVERLOADS, INCREASING SPEEDS, PACO PUMP 39
Table 9.1 Results of Tests 9AA to 9AF 40
Table 9.2 Results of Tests 9BA to 9BG 42
Table 9.3 Results of Tests 9CA to 9CF 44

Table 10.0 Conditions for Test Series 10
OVERLOADS, MODIFIED BOTTOM HALF BEARING. 46
Table 10.1 Results of Tests 10AA to 10AG 47
Table 10.2 Results of Tests 10BA to 10BG 49
Table 10.3 Results of Tests 10CA to 10CD 51

Table 11.0 Conditions for Test Series 11
RATED VERTICAL LOAD, INCREASING LATERAL LOAD,
SHAFT STOPPED 52
Table 11.1 Results of Tests 11A to 11F 53

Table 12.0 Conditions for Test Series 12
RATED VERTICAL LOAD, INCREASING LATERAL LOAD,
CONSTANT RPM 55
Table 12.1 Results of Tests 12A to 12G 56

Table 13.0 Conditions for Test Series 13
RATED VERTICAL LOAD, IMPULSIVE LATERAL LOAD,
CONSTANT RPM 58
Table 13.1 Results of Tests 13A-90 to 13A-90E 59
Table 13.2 Results of Tests 13B-90B to 13B-90G 61
Table 13.3 Results of Tests 13C-90B to 13C-90G 63
Table 13.4 Results of Tests 13D-90B to 13D-90G 65

Table 14.0 Conditions for Test Series 14
INCREASING VERTICAL OVERLOAD, SHAFT STOPPED 67
Table 14.1 Results of Tests 14-101A to 14-101D 68

Table 15.0 Conditions for Test Series 15
INCREASING VERTICAL OVERLOAD. DECREASING RPM 69
Table 15.1 Results of Tests 15-107A to 15-107D 70

Table 16.0 Conditions for Test Series 16
CONSTANT IMPULSIVE VERTICAL OVERLOAD, CONSTANT RPM 71
Table 16.1 Results of Tests 16A-107A and 16A-107B 72
Table 16.2 Results of Tests 16B-107C to 16B-107F 73
Table 16.3 Results of Tests 16C-107G to 16C-107J 74

Table 17.0 Conditions for Test Series 17
IMPULSIVE VERTICAL OVERLOAD
WITH AIR VESSELS 75
Table 17.1 Results of Test Sheets 120, 123, 125 and 127 76

There are no tables associated with Test Series 18

There are no tables associated with Test Series 19

Table 20.00 Conditions for Test Series 20
LOAD/FLOAT/PRESSURE/FLOW RELATIONSHIP INVESTIGATION 77
Table 20.0A DECREASING MANIFOLD PRESSURES, RATED APPLIED LOAD
Results of Tests A to N 78
Table 20.0B INCREASING MANIFOLD PRESSURES, RATED APPLIED LOAD
Results of Tests A to P 82
Table 20.1A DECREASING MANIFOLD PRESSURES, 1000 LB APPLIED LOAD
Results of Tests A to Q 86

Table 20.1B INCREASING MANIFOLD PRESSURES, 1000 LB APPLIED LOAD Results of Tests A to N 91
Table 20.2A DECREASING MANIFOLD PRESSURES, 2000 LB APPLIED LOAD Results of Tests A to P 95
Table 20.2B INCREASING MANIFOLD PRESSURES, 2000 LB APPLIED LOAD Results of Tests A to S 99
Table 20.3A DECREASING MANIFOLD PRESSURES, 3000 LB APPLIED LOAD Results of Tests A to O 104
Table 20.3B INCREASING MANIFOLD PRESSURES, 3000 LB APPLIED LOAD Results of Tests A to T 108
Table 20.4A DECREASING MANIFOLD PRESSURES, 4000 LB APPLIED LOAD Results of Tests A to Q 113
Table 20.4B INCREASING MANIFOLD PRESSURES, 4000 LB APPLIED LOAD Results of Tests A to S 118
Table 20.5A DECREASING MANIFOLD PRESSURES, 5000 LB APPLIED LOAD Results of Tests A to N 123
Table 20.5B INCREASING MANIFOLD PRESSURES, 5000 LB APPLIED LOAD Results of Tests A to O 127
Table 20.6A DECREASING MANIFOLD PRESSURES, 6000 LB APPLIED LOAD Results of Tests A to N 131
Table 20.6B INCREASING MANIFOLD PRESSURES, 6000 LB APPLIED LOAD Results of Tests A to M 135
Table 20.7A DECREASING MANIFOLD PRESSURES, 7000 LB APPLIED LOAD Results of Tests A to P 139
Table 20.7B INCREASING MANIFOLD PRESSURES, 7000 LB APPLIED LOAD Results of Tests A to Q 143
Table 20.8A DECREASING MANIFOLD PRESSURES, 8000 LB APPLIED LOAD Results of Tests A to R 148
Table 20.8B INCREASING MANIFOLD PRESSURES, 8000 LB APPLIED LOAD Results of Tests A to R 153
Table 20.9A DECREASING MANIFOLD PRESSURES, 9000 LB APPLIED LOAD Results of Tests A to S 158
Table 20.9B INCREASING MANIFOLD PRESSURES, 9000 LB APPLIED LOAD Results of Tests A to R 163

TABLE 0.1 TABLE 0.1

SUMMARY OF CONDITIONS IMPOSED DURING EACH SERIES OF TESTS

TABLE NUMBERS	1.1 - 1.7	2.1	3.1	4.1	4.2	5.1	6.1	7.1
TEST SERIES	1	2	3	4A	4B	5	6	7
ORIFICES?	N	N	Y	Y	Y	N	Y	Y
CHECK VALVES?	N	Y	Y	Y	Y	Y	Y	Y
AIR VESSELS?	N	N	N	N	N	N	N	N
PRESSURE REGULATOR?	N	N	N	N	N	N	N	N
KOBE OR PACO PUMP	K	K	K	K	K	K	K	K
SHAFT ROTATION	S	I	I	I	I	S	S	C
VERTICAL LOADING	I	R	R	R	R	IO	O	IO
LATERAL LOADING	N	N	N	N	N	N	N	N
WATER: FRESH/SEA	FW	FW	FW	SW	SW	FW	SW	FW
WATER: CHILLED/AMBIENT	AM	AM	AM	CH	AM	AM	AM	AM
BOTTOM HALF MODIFIED?	N	N	N	N	N	N	N	N
DATA LOGGER CONNECTED?	N	N	N	N	N	N	N	N

TABLE NUMBERS	8.1	8.2	9.1	9.2	9.3	10.1	10.2	10.3	11.1
TEST SERIES	8A	8B	9A	9B	9C	10A	10B	10C	11
ORIFICES?	Y	Y	Y	Y	Y	Y	Y	Y	Y
CHECK VALVES?	Y	Y	Y	Y	Y	Y	Y	Y	Y
AIR VESSELS?	N	N	N	N	N	N	N	N	N
PRESSURE REGULATOR?	Y	Y	Y	Y	Y	Y	Y	Y	Y
KOBE OR PACO PUMP	P	P	P	P	P	P	P	P	P
SHAFT ROTATION	S	S	I	I	I	I	I	S	S
VERTICAL LOADING	IO	IO	R	CO	CO	R	CO	IO	R
LATERAL LOADING	N	N	N	N	N	N	N	N	I
WATER: FRESH/SEA	FW	FW	FW	FW	FW	FW	FW	FW	FW
WATER: CHILLED/AMBIENT	AM	AM	AM	AM	AM	AM	AM	AM	AM
BOTTOM HALF MODIFIED?	N	N	N	N	N	Y	Y	Y	Y
DATA LOGGER CONNECTED?	N	N	N	N	N	N	N	N	N

Y	YES	N	NO	S	STOPPED
R	RATED	C	CONSTANT	I	INCREASING
O	OVERLOAD	V	IMPULSIVE	AM	AMBIENT
FW	FRESH WATER	SW	SEA WATER	CH	CHILLED
K	KOBE PUMP	P	PACO PUMP	*	VARIOUS

TABLE 0.1 CONTINUED TABLE 0.1

SUMMARY OF CONDITIONS IMPOSED DURING EACH SERIES OF TESTS

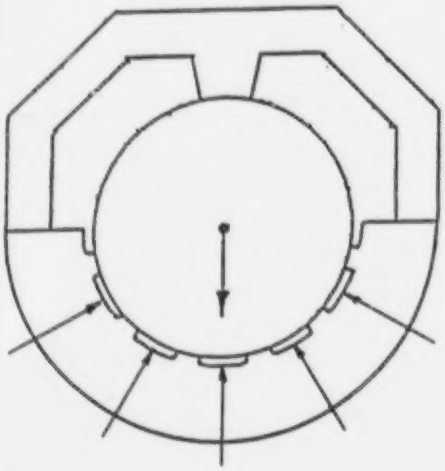
TABLE NUMBERS	12.1	13.1	13.2	13.3	13.4	14.1	15.1
TEST SERIES	12	13A	13B	13C	13D	14	15
ORIFICES?	Y	Y	Y	Y	Y	Y	Y
CHECK VALVES?	Y	Y	Y	Y	Y	Y	Y
AIR VESSELS?	N	N	N	N	N	N	N
PRESSURE REGULATOR?	Y	Y	Y	Y	Y	Y	Y
KOBE OR PACO PUMP	P	P	P	P	P	P	P
SHAFT ROTATION	C	C	C	C	C	S	Y
VERTICAL LOADING	R	R	R	R	R	IO	IO
LATERAL LOADING	I	I	V	V	V	N	N
WATER: FRESH/SEA	FW	FW	FW	FW	FW	FW	FW
WATER: CHILLED/AMBIENT	AM	AM	AM	AM	AM	AM	AM
BOTTOM HALF MODIFIED?	Y	Y	Y	Y	Y	Y	Y
DATA LOGGER CONNECTED?	N	Y	Y	Y	Y	Y	Y

TABLE NUMBERS	16.1	16.2	16.3	17.1	None	None	20.*
TEST SERIES	16A	16B	16C	17	18	19	20
ORIFICES?	Y	Y	Y	Y	Y	Y	Y
CHECK VALVES?	Y	Y	Y	Y	Y	Y	Y
AIR VESSELS?	N	N	N	Y	N	N	N
PRESSURE REGULATOR?	Y	Y	Y	Y	Y	Y	Y
KOBE OR PACO PUMP	P	P	P	P	P	P	P
SHAFT ROTATION	Y	C	C	S	*	S	S
VERTICAL LOADING	R	VO	VO	VO	*	R	*
LATERAL LOADING	N	N	N	N	*	N	N
WATER: FRESH/SEA	FW	FW	FW	FW	FW	FW	FW
WATER: CHILLED/AMBIENT	AM	AM	AM	AM	AM	AM	AM
BOTTOM HALF MODIFIED?	Y	Y	Y	Y	Y	Y	Y
DATA LOGGER CONNECTED?	Y	Y	Y	Y	Y	Y	Y

Y	YES	N	NO	S	STOPPED
R	RATED	C	CONSTANT	I	INCREASING
O	OVERLOAD	V	IMPULSIVE	AM	AMBIENT
FW	FRESH WATER	SW	SEA WATER	CH	CHILLED
K	KOBE PUMP	P	PACO PUMP	*	VARIOUS

```
TABLE 1.0                                                     TABLE 1.0
-----------------------------------------------------------------------
| CONDITIONS FOR | PRELIMINARY TESTS, PISTONS REMOVED FROM TOP HALF   |
| TEST SERIES 1  |              PRESSURES AND FLOW RATES              |
|Sheets 34 to 39 |----------------------------------------------------|
|(Data taken from|               RECESSES               |UNIT|TOP     |
| Test Sheet 39D)|    PORT                         STBD |    |MANIFOLD|
|----------------|--------------------------------------|----|--------|
|                |      |      | FORWARD |      |      |psig|Pressure|
|   TOP          |      |      |         |      |      |igpm|    psig|
|                |-------------------------------------------|        |
|   HALF         |Av.Press    .  psig|Summed Flow        igpm|Totaliser|
|                |-------------------------------------------|flows to|
|   BEARING      |      |      |   AFT   |      |      |psig|recesses|
|                |      |      |         |      |      |igpm|    igpm|
|----------------|----------------------------------------------------|
```

```
|   CONDITIONS   |                                      |PISTON PRESSURE|
|   IMPOSED ON   |                                      |           psig|
|   BEARING      |                                      |---------------|
|                |                                      |               |
|LOAD:   5275 lb |                                      |  PERFORMANCE  |
|        (100 %) |                                      |  OF BEARING   |
|Steady Vertical |                                      |               |
|                |                                      |               |
|RPM:    Nil     |                                      |FLOAT OF SHAFT |
|                |                                      |   = 0.0020 in |
|FLUID: Fresh    |                                      |               |
|       water    |                                      |AVERAGE DIS-   |
|Outlet          |                                      |CHARGE VELOCITY|
|Temperature     |                                      |   = 78.1 ft/s |
|           .  C |                                      |               |
|                |                                      |HYDRAULIC WORK |
|FIXED FOR ALL OF|                                      |   = 2.314 HP  |
|SERIES 1 TESTS: |                                      |               |
|Orifices    :No |                                      |Notes: Escape  |
|Check Valves:No |                                      |velocity based |
|Air Vessels :No |                                      |on 50.12 inch  |
|Press. Reg. :No |                                      |long gap with  |
|Bot.modified:No |                                      |0.001 in width.|
|Data Logger :No |                                      |               |
|Pump: KOBE      |                                      |Hydraulic HP = |
|                |                                      |psi x igpm/1430|
```



```
|----------------|--------------------------------------|---------------|
|                | FIVE FORWARD/AFT PAIRS OF RECESSES   |UNIT|BOTTOM    |
|  BOTTOM        |--------------------------------------|----|MANIFOLD  |
|  HALF          |PORT  |PORT  | CENTRE  |STBD  |STBD   |    |----------|
|  BEARING       |OUTER |INNER |         |INNER |OUTER  |    |Pressure  |
|                |--------------------------------------|    | 163  psig|
|  In fwd recess:|      |      |         |      |       |psig|          |
|  Total to pair:|      |      |         |      |       |igpm|          |
|                |-------------------------------------------|Totaliser |
|                |Av.Press    .  psig|Summed Flow   .    igpm|flows to  |
|------------------------------------------------------------|recesses  |
|  Total flow to bearing (Gemst totaliser)  =     20.3   igpm|20.3  igpm|
-------------------------------------------------------------------------
```

TABLE 1.1

TABLE 1.1

PRELIMINARY TESTS. PISTONS REMOVED FROM TOP HALF
TEST SHEET 34 - 1000 LB VERTICAL LOAD

TEST SERIES 1 RESULTS	34A	34B	34C	34D
IMPOSED CONDITIONS				
SHAFT RPM	Nil rpm	Nil rpm	Nil rpm	Nil rpm
"APPLIED" LOAD	1000 lb	804 lb	791 lb	779 lb
+ "PISTON" LOAD	0 lb	196 lb	209 lb	221 lb
= TOTAL LOAD	1000 lb	1000 lb	1000 lb	1000 lb
OTHER CONDITIONS	Fixed for the test series, given in Table 1.0.			
PRESSURES AND FLOW RATES				
FLOW TO BEARING	0.0 igpm	4.3 igpm	6.4 igpm	9.3 igpm
MANIFOLD PRESSURE	0 psig	31 psig	33 psig	35 psig
PERFORMANCE OF BEARING				
FLOAT OF SHAFT	0.0005 in	0.0010 in	0.0015 in	0.0020 in
AV. DISCHARGE VELOCITY	0.0 ft/s	33.1 ft/s	32.8 ft/s	35.8 ft/s
HYDRAULIC WORK	0.0 hp	0.093 hp	0.148 hp	0.228 hp

TEST SERIES 1 RESULTS	34E	34F	34G	
IMPOSED CONDITIONS				
SHAFT RPM	Nil rpm	Nil rpm	Nil rpm	rpm
"APPLIED" LOAD	772 lb	747 lb	684 lb	lb
+ "PISTON" LOAD	228 lb	253 lb	316 lb	lb
= TOTAL LOAD	1000 lb	1000 lb	1000 lb	lb
OTHER CONDITIONS	Fixed for the test series, given in Table 1.0.			
PRESSURES AND FLOW RATES				
FLOW TO BEARING	9.4 igpm	12.2 igpm	17.0 igpm	igpm
MANIFOLD PRESSURE	36 psig	40 psig	50 psig	psig
PERFORMANCE OF BEARING				
FLOAT OF SHAFT	0.0025 in	0.0030 in	0.0035 in	in
AV. DISCHARGE VELOCITY	28.9 ft/s	31.3 ft/s	37.3 ft/s	ft/s
HYDRAULIC WORK	0.237 hp	0.341 hp	0.594 hp	hp

Notes: (1) Average discharge velocity (based on a gap 50.12 inches long) is 7.69 ft/s per igpm of flow per 0.001 inch of width.
(2) Hydraulic work (hp) is defined as (psig x igpm)/1430

TABLE 1.2

TABLE 1.2

PRELIMINARY TESTS, PISTONS REMOVED FROM TOP HALF
TEST SHEET 35 - 2000 LB VERTICAL LOAD

TEST SERIES 1 RESULTS	35A	35B	35C	35D
IMPOSED CONDITIONS				
SHAFT RPM	Nil rpm	Nil rpm	Nil rpm	Nil rpm
"APPLIED" LOAD	1728 lb	1646 lb	1633 lb	1621 lb
+ "PISTON" LOAD	272 lb	354 lb	367 lb	379 lb
= TOTAL LOAD	2000 lb	2000 lb	2000 lb	2000 lb
OTHER CONDITIONS	Fixed for the test series, given in Table 1.0.			
PRESSURES AND FLOW RATES				
FLOW TO BEARING	4.2 igpm	6.4 igpm	9.7 igpm	12.0 igpm
MANIFOLD PRESSURE	43 psig	56 psig	58 psig	60 psig
PERFORMANCE OF BEARING				
FLOAT OF SHAFT	0.0005 in	0.0010 in	0.0015 in	0.0020 in
AV. DISCHARGE VELOCITY	64.6 ft/s	49.2 ft/s	49.7 ft/s	46.1 ft/s
HYDRAULIC WORK	0.126 hp	0.251 hp	0.393 hp	0.503 hp

TEST SERIES 1 RESULTS	35E	35F	35G	
IMPOSED CONDITIONS				
SHAFT RPM	Nil rpm	Nil rpm	Nil rpm	rpm
"APPLIED" LOAD	1602 lb	1576 lb	1532 lb	lb
+ "PISTON" LOAD	398 lb	424 lb	468 lb	lb
= TOTAL LOAD	2000 lb	2000 lb	2000 lb	lb
OTHER CONDITIONS	Fixed for the test series, given in Table 1.0.			
PRESSURES AND FLOW RATES				
FLOW TO BEARING	13.8 igpm	17.4 igpm	21.5 igpm	igpm
MANIFOLD PRESSURE	63 psig	67 psig	74 psig	psig
PERFORMANCE OF BEARING				
FLOAT OF SHAFT	0.0025 in	0.0030 in	0.0035 in	in
AV. DISCHARGE VELOCITY	42.4 ft/s	44.6 ft/s	47.2 ft/s	ft/s
HYDRAULIC WORK	0.608 hp	0.815 hp	1.113 hp	hp

Notes: (1) Average discharge velocity (based on a gap 50.12 inches long) is 7.69 ft/s per igpm of flow per 0.001 inch of width.
(2) Hydraulic work (hp) is defined as (psig x igpm)/1430

TABLE 1.3

PRELIMINARY TESTS, PISTONS REMOVED FROM TOP HALF
TEST SHEET 36 - 3000 LB VERTICAL LOAD

TEST SERIES 1 RESULTS	36A	36B	36C	36D
IMPOSED CONDITIONS				
SHAFT RPM	Nil rpm	Nil rpm	Nil rpm	Nil rpm
"APPLIED" LOAD	2513 lb	2450 lb	2412 lb	2399 lb
+ "PISTON" LOAD	487 lb	550 lb	588 lb	601 lb
= TOTAL LOAD	3000 lb	3000 lb	3000 lb	3000 lb
OTHER CONDITIONS	Fixed for the test series, given in Table 1.0.			
PRESSURES AND FLOW RATES				
FLOW TO BEARING	5.5 igpm	8.2 igpm	12.7 igpm	15.8 igpm
MANIFOLD PRESSURE	77 psig	87 psig	93 psig	95 psig
PERFORMANCE OF BEARING				
FLOAT OF SHAFT	0.0005 in	0.0010 in	0.0015 in	0.0020 in
AV. DISCHARGE VELOCITY	84.6 ft/s	63.1 ft/s	65.1 ft/s	60.8 ft/s
HYDRAULIC WORK	0.296 hp	0.499 hp	0.826 hp	1.050 hp

TEST SERIES 1 RESULTS	36E	36F	36G	
IMPOSED CONDITIONS				
SHAFT RPM	Nil rpm	Nil rpm	Nil rpm	rpm
"APPLIED" LOAD	2387 lb	2355 lb	2311 lb	lb
+ "PISTON" LOAD	613 lb	645 lb	689 lb	lb
= TOTAL LOAD	3000 lb	3000 lb	3000 lb	lb
OTHER CONDITIONS	Fixed for the test series, given in Table 1.0.			
PRESSURES AND FLOW RATES				
FLOW TO BEARING	18.2 igpm	22.0 igpm	26.5 igpm	igpm
MANIFOLD PRESSURE	97 psig	102 psig	109 psig	psig
PERFORMANCE OF BEARING				
FLOAT OF SHAFT	0.0025 in	0.0030 in	0.0035 in	in
AV. DISCHARGE VELOCITY	56.0 ft/s	56.4 ft/s	58.2 ft/s	ft/s
HYDRAULIC WORK	1.235 hp	1.569 hp	2.070 hp	hp

Notes: (1) Average discharge velocity (based on a gap 50.12 inches long) is 7.69 ft/s per igpm of flow per 0.001 inch of width.
(2) Hydraulic work (hp) is defined as (psig x igpm)/1430

PRELIMINARY TESTS, PISTONS REMOVED FROM TOP HALF
TEST SHEET 37 - 4000 LB VERTICAL LOAD

TEST SERIES 1 RESULTS	37A		37B		37C		37D	
IMPOSED CONDITIONS								
SHAFT RPM	Nil	rpm	Nil	rpm	Nil	rpm	Nil	rpm
"APPLIED" LOAD	3330	lb	3266	lb	3228	lb	3222	lb
+ "PISTON" LOAD	670	lb	734	lb	772	lb	778	lb
= TOTAL LOAD	4000	lb	4000	lb	4000	lb	4000	lb
OTHER CONDITIONS	Fixed for the test series, given in Table 1.0.							
PRESSURES AND FLOW RATES								
FLOW TO BEARING	6.4	igpm	9.3	igpm	14.3	igpm	18.0	igpm
MANIFOLD PRESSURE	106	psig	116	psig	122	psig	123	psig
PERFORMANCE OF BEARING								
FLOAT OF SHAFT	0.0005	in	0.0010	in	0.0015	in	0.0020	in
AV. DISCHARGE VELOCITY	98.4	ft/s	71.5	ft/s	73.3	ft/s	69.2	ft/s
HYDRAULIC WORK	0.474	hp	0.754	hp	1.220	hp	1.584	hp

TEST SERIES 1 RESULTS	37E		37F		37G			
IMPOSED CONDITIONS								
SHAFT RPM	Nil	rpm	Nil	rpm	Nil	rpm		rpm
"APPLIED" LOAD	3203	lb	3165	lb	3163	lb		lb
+ "PISTON" LOAD	797	lb	835	lb	873	lb		lb
= TOTAL LOAD	4000	lb	4000	lb	4000	lb		lb
OTHER CONDITIONS	Fixed for the test series, given in Table 1.0.							
PRESSURES AND FLOW RATES								
FLOW TO BEARING	21.0	igpm	25.6	igpm	29.6	igpm		igpm
MANIFOLD PRESSURE	126	psig	132	psig	138	psig		psig
PERFORMANCE OF BEARING								
FLOAT OF SHAFT	0.0025	in	0.0030	in	0.0035	in		in
AV. DISCHARGE VELOCITY	64.6	ft/s	65.6	ft/s	65.0	ft/s		ft/s
HYDRAULIC WORK	1.850	hp	2.363	hp	2.857	hp		hp

Notes: (1) Average discharge velocity (based on a gap 50.12 inches long) is 7.69 ft/s per igpm of flow per 0.001 inch of width.
(2) Hydraulic work (hp) is defined as (psig x igpm)/1430

TABLE 1.5 TABLE 1.5

PRELIMINARY TESTS, PISTONS REMOVED FROM TOP HALF
TEST SHEET 38 - 5000 LB VERTICAL LOAD

TEST SERIES 1 RESULTS	38A	38B	38C	38D
IMPOSED CONDITIONS				
SHAFT RPM	Nil rpm	Nil rpm	Nil rpm	Nil rpm
"APPLIED" LOAD	4172 lb	4089 lb	4038 lb	4020 lb
+ "PISTON" LOAD	828 lb	911 lb	962 lb	980 lb
= TOTAL LOAD	5000 lb	5000 lb	5000 lb	5000 lb
OTHER CONDITIONS	Fixed for the test series, given in Table 1.0.			
PRESSURES AND FLOW RATES				
FLOW TO BEARING	7.0 igpm	10.4 igpm	15.4 igpm	20.0 igpm
MANIFOLD PRESSURE	131 psig	144 psig	152 psig	155 psig
PERFORMANCE OF BEARING				
FLOAT OF SHAFT	0.0005 in	0.0010 in	0.0015 in	0.0020 in
AV. DISCHARGE VELOCITY	107.7 ft/s	80.0 ft/s	78.9 ft/s	76.9 ft/s
HYDRAULIC WORK	0.641 hp	1.047 hp	1.637 hp	2.168 hp

TEST SERIES 1 RESULTS	38E	38F	38G	
IMPOSED CONDITIONS				
SHAFT RPM	Nil rpm	Nil rpm	Nil rpm	rpm
"APPLIED" LOAD	4001 lb	3963 lb	3931 lb	lb
+ "PISTON" LOAD	999 lb	1037 lb	1069 lb	lb
= TOTAL LOAD	5000 lb	5000 lb	5000 lb	lb
OTHER CONDITIONS	Fixed for the test series, given in Table 1.0.			
PRESSURES AND FLOW RATES				
FLOW TO BEARING	23.6 igpm	28.9 igpm	32.5 igpm	igpm
MANIFOLD PRESSURE	158 psig	164 psig	169 psig	psig
PERFORMANCE OF BEARING				
FLOAT OF SHAFT	0.0025 in	0.0030 in	0.0035 in	in
AV. DISCHARGE VELOCITY	72.6 ft/s	74.1 ft/s	71.4 ft/s	ft/s
HYDRAULIC WORK	2.608 hp	3.314 hp	3.841 hp	hp

Notes: (1) Average discharge velocity (based on a gap 50.12 inches long) is 7.69 ft/s per igpm of flow per 0.001 inch of width.
(2) Hydraulic work (hp) is defined as (psig x Sgpm)/1430

TABLE 1.6 TABLE 1.6

PRELIMINARY TESTS, PISTONS REMOVED FROM TOP HALF
TEST SHEET 39 - 5275 LB VERTICAL LOAD

TEST SERIES 1 RESULTS	39A	39B	39C	39D
IMPOSED CONDITIONS				
SHAFT RPM	Nil rpm	Nil rpm	Nil rpm	Nil rpm
"APPLIED" LOAD	4390 lb	4326 lb	4276 lb	4244 lb
+ "PISTON" LOAD	885 lb	949 lb	999 lb	1031 lb
= TOTAL LOAD	5275 lb	5275 lb	5275 lb	5275 lb
OTHER CONDITIONS	Fixed for the test series, given in Table 1.0.			
PRESSURES AND FLOW RATES				
FLOW TO BEARING	7.2 igpm	10.6 igpm	15.6 igpm	20.3 igpm
MANIFOLD PRESSURE	140 psig	150 psig	158 psig	163 psig
PERFORMANCE OF BEARING				
FLOAT OF SHAFT	0.0005 in	0.0010 in	0.0015 in	0.0020 in
AV. DISCHARGE VELOCITY	110.7 ft/s	81.5 ft/s	80.0 ft/s	78.1 ft/s
HYDRAULIC WORK	0.705 hp	1.112 hp	1.724 hp	2.314 hp

TEST SERIES 1 RESULTS	39E	39F	39G	
IMPOSED CONDITIONS				
SHAFT RPM	Nil rpm	Nil rpm	Nil rpm	rpm
"APPLIED" LOAD	4219 lb	4181 lb	4162 lb	lb
+ "PISTON" LOAD	1056 lb	1094 lb	1113 lb	lb
= TOTAL LOAD	5275 lb	5275 lb	5275 lb	lb
OTHER CONDITIONS	Fixed for the test series, given in Table 1.0.			
PRESSURES AND FLOW RATES				
FLOW TO BEARING	24.2 igpm	29.7 igpm	32.5 igpm	igpm
MANIFOLD PRESSURE	167 psig	173 psig	176 psig	psig
PERFORMANCE OF BEARING				
FLOAT OF SHAFT	0.0025 in	0.0030 in	0.0035 in	in
AV. DISCHARGE VELOCITY	74.4 ft/s	76.1 ft/s	72.5 ft/s	ft/s
HYDRAULIC WORK	2.826 hp	3.593 hp	4.062 hp	hp

Notes: (1) Average discharge velocity (based on a gap 50.12 inches long) is 7.69 ft/s per igpm of flow per 0.001 inch of width.
(2) Hydraulic work (hp) is defined as (psig x igpm)/1430

TABLE 1.7 TABLE 1.7

PRELIMINARY TESTS, PISTONS REMOVED FROM TOP HALF
SUMMARY OF RESULTS FROM TABLES 1.1 TO 1.6
GROUPED UNDER INCREMENTS OF SHAFT FLOAT

SHAFT FLOAT in	TOTAL LOAD lb	MANIFOLD PRESSURE psig	FLOW TO BEARING igpm	AV. DISCH. VELOCITY ft/s	HYDRAULIC WORK hp	TEST SHEET No.
0.0005	1000	-	-	-	-	34
0.0005	2000	43	4.2	64.6	0.126	35
0.0005	3000	77	5.5	84.6	0.296	36
0.0005	4000	106	6.4	98.4	0.474	37
0.0005	5000	131	7.0	107.7	0.641	38
0.0005	5275	140	7.2	110.7	0.705	39
0.0010	1000	31	4.3	33.1	0.093	34
0.0010	2000	56	6.4	49.2	0.251	35
0.0010	3000	87	8.2	63.1	0.499	36
0.0010	4000	116	9.3	71.5	0.754	37
0.0010	5000	144	10.4	80.0	1.047	38
0.0010	5275	150	10.6	81.5	1.112	39
0.0015	1000	33	6.4	32.8	0.148	34
0.0015	2000	58	9.7	49.7	0.393	35
0.0015	3000	93	12.7	65.1	0.826	36
0.0015	4000	122	14.3	73.3	1.220	37
0.0015	5000	152	15.4	78.9	1.637	38
0.0015	5275	158	15.6	80.0	1.724	39
0.0020	1000	35	8.3	35.8	0.228	34
0.0020	2000	60	12.0	46.1	0.503	35
0.0020	3000	95	15.8	60.8	1.050	36
0.0020	4000	123	18.0	69.2	1.548	37
0.0020	5000	155	20.0	76.9	2.168	38
0.0020	5275	163	20.3	78.1	2.314	39
0.0025	1000	36	9.4	28.9	0.237	34
0.0025	2000	63	13.8	42.4	0.608	35
0.0025	3000	97	18.2	56.0	1.235	36
0.0020	4000	126	21.0	64.6	1.850	37
0.0025	5000	158	23.6	72.6	2.608	38
0.0025	5275	167	24.2	74.4	2.826	39
0.0030	1000	40	12.2	31.3	0.341	34
0.0030	2000	67	17.4	44.6	0.815	35
0.0030	3000	102	22.0	56.4	1.569	36
0.0030	4000	132	25.6	65.6	2.363	37
0.0030	5000	164	28.9	74.1	3.314	38
0.0030	5257	173	29.7	76.1	3.593	39
0.0035	1000	50	17.0	37.3	0.594	34
0.0035	2000	74	21.5	47.2	1.113	35
0.0035	3000	109	26.5	58.2	2.070	36
0.0035	4000	138	29.6	65.0	2.857	37
0.0035	5000	169	62.5	71.4	3.841	38
0.0035	5275	176	33.0	72.5	4.062	39

TABLE 2.0

TABLE 2.0

CONDITIONS FOR TEST SERIES 2
Test Sheet No.43
(Data taken from 2F Test Results)

RATED LOAD, INCREASING SPEED, NO ORIFICES
PRESSURES AND FLOW RATES

	RECESSES PORT			RECESSES STBD		UNIT	TOP MANIFOLD
TOP	43.5	43.1	FORWARD	40.3	40.0	psig	Pressure
	0.85	0.80		0.47	0.70	igpm	46.0 psig
HALF	Av.Press 42.7 psig			Summed Flow 6.98 igpm			Totaliser flows to recesses
BEARING	46.7	43.0	AFT	40.7	44.2	psig	
	0.80	1.20		0.88	1.28	igpm	7.6 igpm

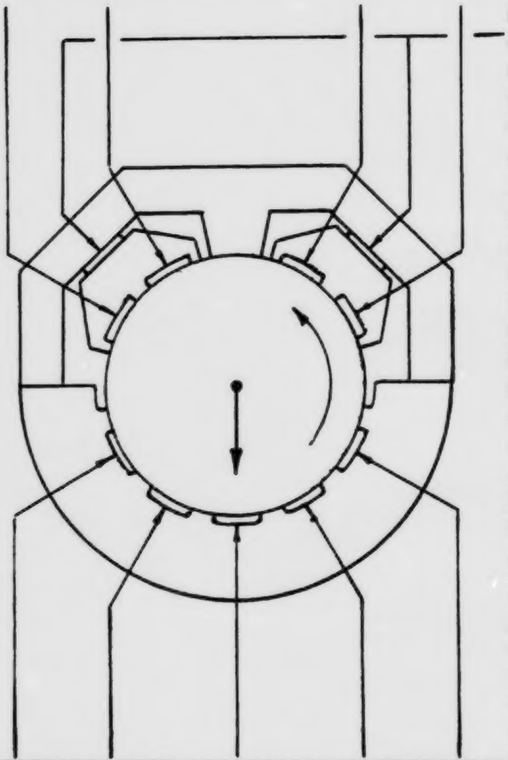
CONDITIONS IMPOSED ON BEARING

LOAD: 5449 lb (103.3%)
Steady Vertical

RPM: 554

FLUID: Fresh water
Outlet Temperature 22.2 C

FIXED FOR ALL OF SERIES 2 TESTS:
Orifices :No
Check Valves:Yes
Air Vessels :No
Press. Reg. :No
Bot.modified:No
Data Logger :No
Pump: KOBE



PISTON PRESSURE 156.1 psig

PERFORMANCE OF BEARING

DISPLACEMENT OF SHAFT AXIS = 0.0000 in

COEFFICIENT OF BEARING FRICTION (f) = 0.00323

BOTTOM HALF BEARING	FIVE FORWARD/AFT PAIRS OF RECESSES PORT OUTER	PORT INNER	CENTRE	STBD INNER	STBD OUTER	UNIT	BOTTOM MANIFOLD
							Pressure 157.6 psig
In fwd recess:	153.0		154.6		152.6	psig	
Total to pair:	1.25	2.85	1.60	0.95	3.85	igpm	
	Av.Press 153.4 psig		Summed Flow 10.50 igpm				Totaliser flows to recesses
Total flow to bearing (Gemst totaliser) =					21.8	igpm	14.2 igpm

TABLE 2.1

TABLE 2.1

RATED LOAD, INCREASING SPEED, NO ORIFICES
- IMPOSED CONDITIONS

TEST SHEET 43 RESULTS	2A		2B		2C		2D	
SHAFT RPM	Nil	rpm	112	rpm	220	rpm	329	rpm
Components of constant vertical load:								
APPLIED LOAD	4462	lb	4462	lb	4462	lb	4462	lb
+ PISTON LOAD	978	lb	975	lb	985	lb	977	lb
= TOTAL LOAD	5440	lb	5437	lb	5447	lb	5439	lb
= per cent rated	103.1	%	103.1	%	103.3	%	103.1	%
WATER TEMPERATURE OUT	21.1	C	20.6	C	20.6	C	20.6	C
OTHER CONDITIONS	Fixed for the test series, given in Table 2.0.							

PRESSURES AND FLOW RATES

TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
	PORT OUTER	1.02	43.1	1.02	42.7	0.95	43.5	0.86	44.3
FORWARD	PORT INNER	0.75	43.1	0.75	43.5	0.72	43.5	0.75	43.5
RECESSES	STBD INNER	0.70	40.7	0.70	41.1	0.52	41.5	0.77	41.5
	STBD OUTER	0.65	40.0	0.67	40.3	0.62	40.3	0.68	40.3
	PORT OUTER	1.07	47.1	1.02	46.7	0.90	47.9	0.85	48.3
AFTER	PORT INNER	1.25	43.4	1.20	43.0	1.12	44.2	1.17	44.2
RECESSES	STBD INNER	1.08	41.1	1.09	41.1	0.96	41.1	0.95	41.5
	STBD OUTER	1.20	43.0	1.24	43.4	1.15	44.2	1.20	44.6
Summed Flow, Av.Press.		7.72	42.7	7.69	42.7	6.97	43.3	7.23	43.5
FLOW BY GEMST		8.4		8.4		7.5		7.6	
MANIFOLD PRESSURE			45.7		45.7		46.0		46.5
PISTON PRESSURE			154.6		154.2		155.7		154.4

BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
	PORT OUTER	1.45	151.8	1.10	151.4	1.25	153.8	1.45	153.8
FWD/AFT	PORT INNER	2.75		2.83		2.80		2.85	
PAIRS OF	CENTRE	2.05	154.2	2.00	154.2	1.60	155.0	1.85	155.7
RECESSES	STBD INNER	1.30		1.10		1.05		1.10	
	STBD OUTER	3.90	150.7	4.05	150.7	3.90	152.6	3.95	152.6
Summed Flow, Av.Press.		11.45	152.2	11.10	152.1	10.60	153.8	11.20	154.0
FLOW BY GEMST		14.2		14.3		13.6		14.2	
MANIFOLD PRESSURE			158.0		157.2		158.0		158.0

TOTAL FLOW TO BEARING

BY GEMST TOTALISER	22.6	22.7	21.1	21.8

PERFORMANCE OF BEARING

DISP. OF SHAFT AXIS in	0.0000	0.0000	0.0000	0.0000
COEFF. OF FRICTION	-	0.00363	0.00372	0.00373

TABLE 2.1 CONTINUATION TABLE 2.1

RATED LOAD, INCREASING SPEED, NO ORIFICES
- IMPOSED CONDITIONS

TEST SHEET 43 RESULTS	2E		2F		2G			
SHAFT RPM	440	rpm	554	rpm	Nil	rpm		rpm
Components of constant vertical load:								
APPLIED LOAD	4462	lb	4462	lb	4462	lb		lb
+ PISTON LOAD	985	lb	987	lb	987	lb		lb
= TOTAL LOAD	5447	lb	5449	lb	5449	lb		lb
= per cent rated	103.3	%	103.3	%	103.3	%		%
WATER TEMPERATURE OUT	21.7	C	22.2	C	22.2	C		C
OTHER CONDITIONS	Fixed for the test series, given in Table 2.0.							

PRESSURES AND FLOW RATES

TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
	PORT OUTER	0.85	43.9	0.85	43.5	0.90	43.9		
FORWARD	PORT INNER	0.75	43.5	0.8.	43.1	0.70	43.5		
RECESSES	STBD INNER	0.50	41.1	0.47	40.3	0.65	42.3		
	STBD OUTER	0.72	40.3	0.70	40.0	0.63	40.3		
	PORT OUTER	0.82	46.7	0.80	46.7	1.00	46.7		
AFTER	PORT INNER	1.20	43.0	1.20	43.0	1.12	44.6		
RECESSES	STBD INNER	0.93	41.1	0.88	40.7	1.03	42.2		
	STBD OUTER	1.21	44.2	1.28	44.2	1.12	44.2		
Summed Flow, Av.Press.		6.98	43.0	6.98	42.7	7.15	43.5		
FLOW BY GEMST		7.6		7.6		7.7			
MANIFOLD PRESSURE			46.5		46.0		46.8		
PISTON PRESSURE			155.7		156.1		156.1		

BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
	PORT OUTER	1.45	153.0	1.25	153.0	1.85	153.0		
FWD/AFT	PORT INNER	2.75		2.85		3.20			
PAIRS OF	CENTRE	1.85	153.1	1.60	154.6	2.05	155.7		
RECESSES	STBD INNER	1.00		0.95		1.12			
	STBD OUTER	3.96	152.6	3.85	152.3	3.85	153.4		
Summed Flow, Av.Press.		11.01	153.9	10.50	153.4	12.07	154.0		
FLOW BY GEMST		14.0		14.2		14.4			
MANIFOLD PRESSURE			157.2		157.6		158.0		

TOTAL FLOW TO BEARING

BY GEMST TOTALISER	21.6	21.8	22.1	

PERFORMANCE OF BEARING

DISP. OF SHAFT AXIS in	0.0000	0.0000	0.0000	
COEFF. OF FRICTION	0.00376	0.00323	-	

TABLE 3.0 TABLE 3.0

CONDITIONS FOR TEST SERIES 3 Test Sheet No.58 (Data taken from 3F Test Results)	RATED LOAD, INCREASING SPEED, ORIFICES PRESSURES AND FLOW RATES						
	RECESSES					UNIT	TOP
	PORT			STBD			MANIFOLD
TOP	45.5	48.3	FORWARD	46.9	47.5	psig	Pressure
	1.00	0.96		1.02	0.99	igpm	170.0 psig
HALF	Av.Press 46.8 psig			Summed Flow 8.04 igpm			Totaliser flows to recesses 8.46 igpm
BEARING	45.7	48.0	AFT	44.9	47.4	psig	
	0.92	1.02		0.85	1.28	igpm	

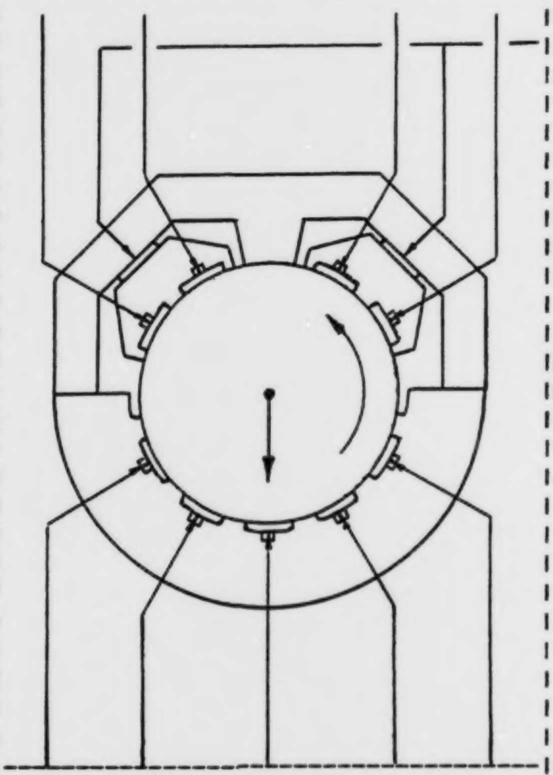
CONDITIONS IMPOSED ON BEARING

LOAD: 5512.1b (104.5%)
Steady Vertical

RPM: 550

FLUID: Fresh water
Outlet Temperature 23.9 C

FIXED FOR ALL OF SERIES 3 TESTS:
Orifices :Yes
Check Valves:Yes
Air Vessels :No
Press. Reg. :No
Bot.modified:No
Data Logger :No
Pump: KOBE



PISTON PRESSURE 166.0 psig

PERFORMANCE OF BEARING

DISPLACEMENT OF SHAFT AXIS
= 0.0000 in

COEFFICIENT OF BEARING FRICTION (f)
= 0.00349

	FIVE FORWARD/AFT PAIRS OF RECESSES					UNIT	BOTTOM MANIFOLD
BOTTOM HALF BEARING	PORT OUTER	PORT INNER	CENTRE	STBD INNER	STBD OUTER		Pressure 171.7 psig
In fwd recess:	145.1		156.5		155.0	psig	
Total to pair:	2.02	2.56	2.13	2.66	3.85	igpm	
	Av.Press 152.2 psig		Summed Flow 13.22 igpm				Totaliser flows to recesses
Total flow to bearing (Gemst totaliser)			=		22.84 igpm		14.38 igpm

TABLE 3.1

TABLE 3.1

RATED LOAD, INCREASING SPEED, ORIFICES
IMPOSED CONDITIONS

TEST SHEET 58 RESULTS		3A		3B		3C		3D	
SHAFT RPM		Nil	rpm	114	rpm	218	rpm	329	rpm
Components of constant vertical load:									
	APPLIED LOAD	4462	lb	4462	lb	4462	lb	4462	lb
	+ PISTON LOAD	1050	lb	1056	lb	1056	lb	1056	lb
	= TOTAL LOAD	5512	lb	5518	lb	5518	lb	5518	lb
	= per cent rated	104.5	%	104.6	%	104.6	%	104.6	%
WATER TEMPERATURE OUT		24.4	C	23.9	C	25.0	C	25.0	C
OTHER CONDITIONS		Fixed for the test series, given in Table 3.0.							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER	0.98	45.9	0.98	45.9	0.99	45.9	0.99	46.3
	PORT INNER	0.93	48.3	0.95	47.9	0.97	48.3	0.98	47.5
	STBD INNER	1.00	46.3	1.02	46.9	1.01	47.3	1.01	47.3
	STBD OUTER	0.95	47.1	0.96	46.7	0.97	46.3	0.98	46.3
AFTER RECESSES	PORT OUTER	0.90	45.3	0.91	45.3	0.92	46.0	0.92	46.4
	PORT INNER	1.00	47.3	1.01	47.3	1.02	48.0	1.02	47.3
	STBD INNER	0.83	43.8	0.84	43.8	0.84	44.5	0.85	43.8
	STBD OUTER	1.26	47.4	1.27	47.4	1.27	48.6	1.28	48.2
Summed Flow, Av.Press.		7.85	46.5	7.94	46.4	7.99	46.9	8.03	46.6
FLOW BY GEMST		8.32		8.32		8.32		8.46	
MANIFOLD PRESSURE			171.0		172.0		172.0		171.0
PISTON PRESSURE			166.0		167.0		167.0		167.0
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	2.22	145.5	2.04	144.3	2.16	146.3	2.13	145.1
	PORT INNER	2.66		2.60		2.69		2.52	
	CENTRE	2.32	155.0	2.19	155.7	2.19	158.1	2.28	155.0
	STBD INNER	2.81		2.77		2.73		2.71	
	STBD OUTER	3.61	155.0	3.93	154.2	3.93	155.0	3.65	156.9
Summed Flow, Av.Press.		13.62	151.8	13.53	151.4	13.70	153.1	13.29	152.3
FLOW BY GEMST		14.65		14.79		14.79		14.59	
MANIFOLD PRESSURE			172.4		172.4		170.0		171.3
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		22.97		23.11		23.11		23.05	
PERFORMANCE OF BEARING									
DISP. OF SHAFT AXIS in		0.0000		0.0000		0.0000		0.0000	
COEFF. OF FRICTION		-		0.00318		0.00319		0.00321	

TABLE 3.1 CONTINUATION TABLE 3.1

RATED LOAD, INCREASING SPEED, ORIFICES
- IMPOSED CONDITIONS

TEST SHEET 58 RESULTS		3E		3F		3G			
SHAFT RPM		433	rpm	550	rpm	Nil	rpm		rpm
Components of constant vertical load:									
	APPLIED LOAD	4462	lb	4462	lb	4462	lb		lb
	+ PISTON LOAD	1050	lb	1050	lb	1050	lb		lb
	= TOTAL LOAD	5512	lb	5512	lb	5512	lb		lb
	= per cent rated	104.5	%	104.5	%	104.5	%		%
WATER TEMPERATURE OUT		23.9	C	23.9	C	23.9	C		C
OTHER CONDITIONS		Fixed for the test series, given in Table 3.0.							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
	PORT OUTER	1.00	46.7	1.00	45.5				
FORWARD	PORT INNER	0.98	47.1	0.96	48.3				
RECESSES	STBD INNER	1.02	48.0	1.02	46.9				
	STBD OUTER	0.98	45.9	0.98	47.5				
	PORT OUTER	0.92	46.0	0.92	45.7				
AFTER	PORT INNER	1.01	46.9	1.02	48.0				
RECESSES	STBD INNER	0.85	43.0	0.85	44.9				
	STBD OUTER	1.27	49.3	1.28	47.4				
Summed Flow, Av.Press.		8.03	46.6	8.08	46.8				
FLOW BY GEMST		8.46		8.46					
MANIFOLD PRESSURE			171.0		170.0		171.0		
PISTON PRESSURE			166.0		166.0		166.0		
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
	PORT OUTER	2.04	145.5	2.02	145.1				
FWD/AFT	PORT INNER	2.58		2.36					
PAIRS OF	CENTRE	2.19	158.9	2.13	156.5				
RECESSES	STBD INNER	2.74		2.66					
	STBD OUTER	3.67	156.9	3.85	155.0				
Summed Flow, Av.Press.		13.22	153.8	13.02	152.2				
FLOW BY GEMST		14.17		14.38					
MANIFOLD PRESSURE			170.9		171.7		171.0		
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		22.63		22.84					
PERFORMANCE OF BEARING									
DISP. OF SHAFT AXIS in		0.0000		0.0000		0.0000			
COEFF. OF FRICTION		0.00343		0.00349		-			

TABLE 4.0

TABLE 4.0

CONDITIONS FOR TEST SERIES 4 Test Sheet No.62 (Data taken from 4A Test Results)	RATED LOAD, INCREASING SPEED, COLD AND WARM SEA WATER PRESSURES AND FLOW RATES						
	RECESSES PORT			STBD		UNIT	TOP MANIFOLD
TOP HALF BEARING	49.1	52.4	FORWARD	49.2	50.3	psig	Pressure 160.2 psig
	1.02	0.95		1.07	0.96	igpm	
	Av.Press 51.1 psig			Summed Flow 8.00 igpm			Totaliser flows to recesses 8.80 igpm
	48.7	51.5	AFT	53.3	54.5	psig	
	0.89	1.00		0.85	1.26	igpm	

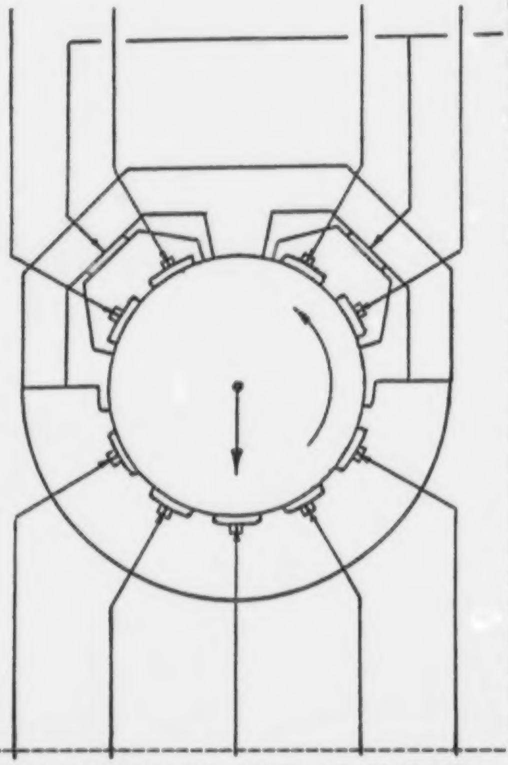
CONDITIONS IMPOSED ON BEARING

LOAD: 5557 lb (105.3%)
Steady Vertical

RPM: Nil

FLUID: Fresh water
Outlet Temperature 15.0 C

FIXED FOR ALL OF SERIES 4 TESTS:
Orifices :Yes
Check Valves:Yes
Air Vessels :No
Press. Reg. :No
Bot.modified:No
Data Logger :No
Pump: KOBE



PISTON PRESSURE 173.1 psig

PERFORMANCE OF BEARING

DISPLACEMENT OF SHAFT AXIS = 0.0000 in

COEFFICIENT OF BEARING FRICTION (f) = -

BOTTOM HALF BEARING	FIVE FORWARD/AFT PAIRS OF RECESSES					UNIT	BOTTOM MANIFOLD
	PORT OUTER	PORT INNER	CENTRE	STBD INNER	STBD OUTER		Pressure 174.8 psig
In fwd recess:	159.8		153.0		164.3	psig	
Total to pair:	2.58	2.43	2.86	3.08	3.16	igpm	
	Av.Press 159.0 psig			Summed Flow 14.11 igpm			Totaliser flows to recesses 14.45 igpm
Total flow to bearing (Gemst totaliser) = 23.25 igpm							

TABLE 4.1 TABLE 4.1

RATED LOAD, INCREASING SPEED, COLD SEA WATER
IMPOSED CONDITIONS

TEST SHEET 62 RESULTS		4AA		4AB		4AC		4AD	
SHAFT RPM		Nil	rpm	114	rpm	222	rpm	333	rpm
Components of constant vertical load:									
	APPLIED LOAD	4462	lb	4462	lb	4462	lb	4462	lb
	+ PISTON LOAD	1095	lb	1099	lb	1102	lb	1116	lb
	= TOTAL LOAD	5557	lb	5561	lb	5564	lb	5578	lb
	= per cent rated	105.3	%	105.4	%	105.5	%	105.7	%
WATER TEMPERATURE OUT		15.0	C	12.2	C	12.2	C	9.4	C
OTHER CONDITIONS		Fixed for the test series, given in Table 4.0.							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER	1.02	49.1	0.99	49.9	0.99	49.5	1.02	50.3
	PORT INNER	0.95	52.4	0.96	52.4	0.98	51.1	0.94	52.0
	STBD INNER	1.07	49.2	1.09	49.6	1.08	50.0	1.08	50.7
	STBD OUTER	0.96	50.3	0.97	49.9	0.97	49.5	0.98	49.9
AFTER RECESSES	PORT OUTER	0.89	48.7	0.90	46.8	0.89	49.1	0.90	49.8
	PORT INNER	1.00	51.5	1.01	51.3	1.00	51.5	0.99	52.3
	STBD INNER	0.85	53.3	0.86	48.3	0.86	48.7	0.87	46.0
	STBD OUTER	1.26	54.5	1.26	54.5	1.26	53.7	1.27	51.3
Summed Flow, Av.Press.		8.00	51.1	8.04	50.4	8.05	50.3	8.08	49.9
FLOW BY GEMST		8.80		8.74		8.67		8.88	
MANIFOLD PRESSURE			160.2		159.9		161.4		159.9
PISTON PRESSURE			173.1		173.8		174.2		176.5
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	2.58	159.8	2.77	158.6	2.67	159.0	2.64	157.8
	PORT INNER	2.43		2.62		2.15		2.13	
	CENTRE	2.86	153.0	3.05	152.2	3.07	151.4	3.18	155.0
	STBD INNER	3.08		3.27		3.27		3.22	
	STBD OUTER	3.16	164.3	3.27	164.3	3.22	163.5	3.03	163.1
Summed Flow, Av.Press.		14.11	159.0	14.98	158.4	14.38	158.0	14.20	158.6
FLOW BY GEMST		14.45		15.62		15.14		15.76	
MANIFOLD PRESSURE			174.8		174.8		173.6		173.6
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		23.25		24.36		23.81		24.64	
PERFORMANCE OF BEARING									
DISP. OF SHAFT AXIS in		0.0000		0.0000		0.0000		0.0000	
COEFF. OF FRICTION		-		0.00254		0.00289		0.00297	

TABLE 4.1 CONTINUATION TABLE 4.1

RATED LOAD, INCREASING SPEED, COLD SEA WATER
IMPOSED CONDITIONS

TEST SHEET 62 RESULTS	4AE		4AF		4AG			
SHAFT RPM	441	rpm	554	rpm	Nil	rpm		rpm
Components of constant vertical load:								
APPLIED LOAD	4462	lb	4462	lb	4462	lb		lb
+ PISTON LOAD	1102	lb	1109	lb	1107	lb		lb
= TOTAL LOAD	5564	lb	5571	lb	5569	lb		lb
= per cent rated	105.5	%	105.6	%	105.6	%		%
WATER TEMPERATURE OUT	9.2	C	8.3	C	7.8	C		C
OTHER CONDITIONS	Fixed for the test series, given in Table 4.0.							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER	0.99	49.5	0.99	51.1	0.99	49.5		
PORT INNER	0.97	50.7	0.96	51.1	0.96	52.8		
STBD INNER	1.08	50.4	1.08	50.7	1.08	49.6		
STBD OUTER	0.98	49.1	0.97	49.1	0.97	49.9		
AFTER RECESSES PORT OUTER	0.91	49.8	0.91	50.6	0.91	46.4		
PORT INNER	1.01	50.7	1.02	51.1	1.02	51.1		
STBD INNER	0.87	46.8	0.89	46.5	0.87	47.6		
STBD OUTER	1.27	52.1	1.27	53.7	1.28	51.3		
Summed Flow, Av.Press.	8.08	49.9	8.09	50.5	8.08	49.8		
FLOW BY GEMST	8.74		8.88		8.74			
MANIFOLD PRESSURE		158.7		160.2		160.2		
PISTON PRESSURE		174.2		175.4		175.0		
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER	2.86	158.6	2.86	159.0	2.88	158.6		
PORT INNER	2.21		2.13		2.13			
CENTRE	3.12	151.8	3.09	153.0	3.09	152.2		
STBD INNER	3.24		3.22		3.27			
STBD OUTER	3.14	164.7	2.97	165.9	2.99	165.1		
Summed Flow, Av.Press.	14.57	158.4	14.27	159.3	14.36	158.6		
FLOW BY GEMST	15.41		15.41		15.55			
MANIFOLD PRESSURE		175.2		173.6		175.6		
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	24.15		24.29		24.29			
PERFORMANCE OF BEARING								
DISP. OF SHAFT AXIS in	0.0000		0.0000		0.0000			
COEFF. OF FRICTION	0.00316		0.00336		-			

TABLE 4.2 TABLE 4.2

RATED LOAD, INCREASING SPEED, WARM SEA WATER
IMPOSED CONDITIONS

TEST SHEET 66 RESULTS	4BA		4BB		4BC		4BD	
SHAFT RPM	Nil	rpm	114	rpm	221	rpm	329	rpm
Components of constant vertical load:								
APPLIED LOAD	4462	lb	4462	lb	4462	lb	4462	lb
+ PISTON LOAD	1097	lb	1107	lb	1114	lb	1123	lb
= TOTAL LOAD	5559	lb	5569	lb	5576	lb	5585	lb
= per cent rated	105.4	%	105.6	%	105.7	%	105.9	%
WATER TEMPERATURE OUT	22.2	C	22.2	C	22.2	C	22.2	C
OTHER CONDITIONS	Fixed for the test series, given in Table 4.0.							

PRESSURES AND FLOW RATES

TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER	1.01	48.7	1.02	48.7	1.02	48.7	1.02	49.9
	PORT INNER	0.94	52.4	0.96	52.4	0.96	52.4	0.96	53.1
	STBD INNER	1.08	49.6	1.09	49.6	1.10	51.1	1.05	51.5
	STBD OUTER	0.98	50.7	1.00	51.6	1.00	51.1	1.02	52.4
AFTER RECESSES	PORT OUTER	0.71	48.3	0.71	49.1	0.72	49.8	0.72	50.6
	PORT INNER	1.06	50.4	1.08	51.9	1.08	51.9	1.09	52.7
	STBD INNER	0.86	48.7	0.87	48.7	0.87	48.7	0.87	46.8
	STBD OUTER	1.28	52.1	1.32	54.1	1.32	53.3	1.32	52.5
Summed Flow, Av.Press.		7.92	50.1	8.05	50.8	8.07	50.9	8.05	51.2
FLOW BY GEMST		8.60		8.60		8.60		8.60	
MANIFOLD PRESSURE			160.6		161.4		161.7		160.6
PISTON PRESSURE			176.5		175.0		176.5		177.6

BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	2.04	149.4	2.21	151.4	2.21	151.0	2.23	150.6
	PORT INNER	2.77		2.67		2.71		2.71	
	CENTRE	2.21	160.0	2.41	160.4	2.47	161.2	2.36	156.9
	STBD INNER	2.73		2.99		3.01		2.84	
	STBD OUTER	3.96	158.1	3.96	159.2	3.89	159.2	3.91	160.8
Summed Flow, Av.Press.		13.71	155.8	14.24	157.0	14.29	157.1	14.05	156.1
FLOW BY GEMST		14.59		15.20		15.62		15.48	
MANIFOLD PRESSURE			175.2		177.6		177.6		177.6

TOTAL FLOW TO BEARING

BY GEMST TOTALISER	23.19	23.80	24.22	24.08

PERFORMANCE OF BEARING

DISP. OF SHAFT AXIS in	0.0000	0.0000	0.0000	0.0000
COEFF. OF FRICTION	-	0.00262	0.00292	0.00330

TABLE 4.2 CONTINUATION TABLE 4.2

RATED LOAD, INCREASING SPEED, WARM SEA WATER
IMPOSED CONDITIONS

TEST SHEET 66 RESULTS	4BE		4BF					
SHAFT RPM	436	rpm	551	rpm		rpm		rpm
Components of constant vertical load:								
APPLIED LOAD	4462	lb	4462	lb		lb		lb
+ PISTON LOAD	1104	lb	1107	lb		lb		lb
= TOTAL LOAD	5566	lb	5569	lb		lb		lb
= per cent rated	105.5	%	105.6	%		%		%
WATER TEMPERATURE OUT	22.2	C	22.2	C		C		C
OTHER CONDITIONS	Fixed for the test series, given in Table 4.0.							

PRESSURES AND FLOW RATES

TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
	PORT OUTER	1.02	49.9	1.02	51.1				
FORWARD	PORT INNER	0.98	52.0	1.00	51.6				
RECESSES	STBD INNER	1.10	51.1	1.09	51.9				
	STBD OUTER	1.01	49.9	1.02	49.9				
	PORT OUTER	0.74	50.6	0.73	50.6				
AFTER	PORT INNER	1.09	51.9	1.09	50.7				
RECESSES	STBD INNER	0.87	46.8	0.87	46.4				
	STBD OUTER	1.32	52.5	1.32	52.5				
Summed Flow, Av.Press.		8.13	50.6	8.14	50.6				
FLOW BY GEMST		8.74		8.74					
MANIFOLD PRESSURE			160.6		161.4				
PISTON PRESSURE			174.6		175.0				

BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
	PORT OUTER	2.24	149.8	2.23	147.9				
FWD/AFT	PORT INNER	2.79		2.81					
PAIRS OF	CENTRE	2.52	160.0	2.54	153.4				
RECESSES	STBD INNER	3.01		3.01					
	STBD OUTER	3.89	160.8	3.87	153.8				
Summed Flow, Av.Press.		14.45	156.9	14.46	151.7				
FLOW BY GEMST		15.48		15.62					
MANIFOLD PRESSURE			177.6		178.0				

TOTAL FLOW TO BEARING

BY GEMST TOTALISER	24.22	24.36		

PERFORMANCE OF BEARING

DISP. OF SHAFT AXIS in	0.0000	0.0000		
COEFF. OF FRICTION	0.00343	0.00354		

TABLE 5.0

TABLE 5.0

INCREASING OVERLOAD, NO ORIFICES, SHAFT STOPPED - PRESSURES AND FLOW RATES

CONDITIONS FOR TEST SERIES 5 Test Sheet No.49 (Data taken from 5G Test Results)	RECESSES					UNIT	TOP MANIFOLD
	PORT				STBD		
TOP HALF BEARING	46.3	46.3	FORWARD	46.1	46.3	psig	Pressure 47.2 psig
	0.85	0.73		0.52	0.54	igpm	
	Av.Press 45.9 psig			Summed Flow 6.79 igpm			Totaliser flows to recesses 5.78 igpm
	46.8	46.5	AFT	44.5	44.6	psig	
	1.01	1.06		0.99	1.09	igpm	

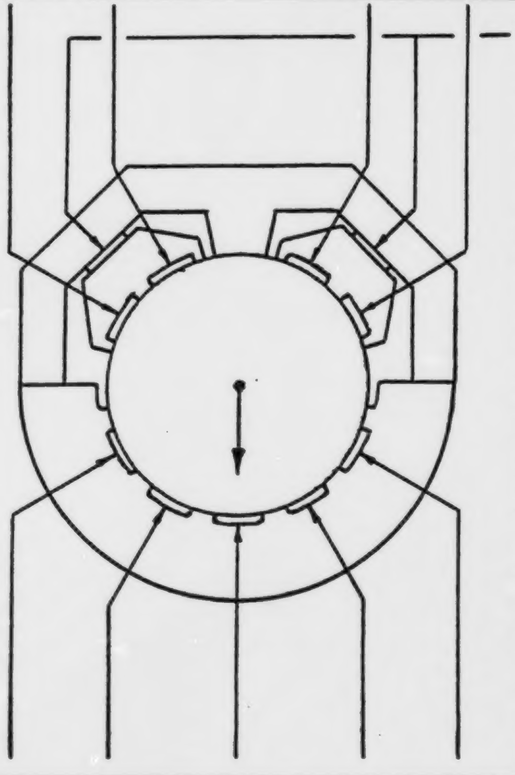
CONDITIONS IMPOSED ON BEARING

LOAD: 6796 lb (128.8%)
Steady Vertical

RPM: Nil

FLUID: Fresh water
Outlet Temperature 22.0 C

FIXED FOR ALL OF SERIES 5 TESTS:
Orifices :No
Check Valves:Yes
Air Vessels :No
Press. Reg. :No
Bot.modified:No
Data Logger :No
Pump: KOBE



PISTON PRESSURE 167.4 psig

PERFORMANCE OF BEARING

DISPLACEMENT OF SHAFT AXIS = 0.00185 in

COEFFICIENT OF BEARING FRICTION (f) = -

BOTTOM HALF BEARING	FIVE FORWARD/AFT PAIRS OF RECESSES					UNIT	BOTTOM MANIFOLD
	PORT OUTER	PORT INNER	CENTRE	STBD INNER	STBD OUTER		Pressure 168.5 psig
In fwd recess:	168.6		169.8		167.4	psig	
Total to pair:	0.56	0.88	0.34	0.43	1.45	igpm	
	Av.Press 168.6 psig			Summed Flow 3.66 igpm			Totaliser flows to recesses
Total flow to bearing (Gemst totaliser) = 11.15 igpm							5.37 igpm

INCREASING OVERLOAD, NO ORIFICES, SHAFT STOPPED

IMPOSED CONDITIONS

TEST SHEET 49 RESULTS		5A		5B		5C		5D	
SHAFT RPM		Nil	rpm	Nil	rpm	Nil	rpm	Nil	rpm
Components of constant									
vertical load:									
	APPLIED LOAD	4462	lb	4599	lb	4737	lb	4874	lb
	PISTON LOAD	1009	lb	1016	lb	1023	lb	1037	lb
	= TOTAL LOAD	5471	lb	5615	lb	5760	lb	5911	lb
	= per cent rated	103.7	%	106.4	%	109.2	%	112.0	%
WATER TEMPERATURE OUT		23.0	C	24.0	C	23.0	C	23.0	C
OTHER CONDITIONS		Fixed for the test series, given in Table 5.0.							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
	PORT OUTER	1.05	45.5	1.03	45.5	1.02	45.9	1.00	46.3
FORWARD	PORT INNER	0.85	45.5	0.85	44.7	0.84	45.5	0.83	45.9
RECESSES	STBD INNER	0.64	44.6	0.65	44.2	0.64	45.0	0.63	45.3
	STBD OUTER	0.67	45.4	0.65	45.1	0.67	45.9	0.64	45.9
	PORT OUTER	1.16	44.9	1.16	44.5	1.16	45.3	1.16	45.3
AFTER	PORT INNER	1.26	45.3	1.25	45.0	1.22	45.3	1.18	46.1
RECESSES	STBD INNER	1.16	43.4	1.15	42.6	1.18	43.0	1.17	43.8
	STBD OUTER	1.27	43.4	1.26	43.0	1.30	43.4	1.25	43.8
Summed Flow, Av.Press.		8.06	44.8	8.00	44.1	8.03	44.9	7.86	45.3
FLOW BY GEMST		6.88		6.88		6.88		6.88	
MANIFOLD PRESSURE			48.7		47.6		47.6		47.6
PISTON PRESSURE			159.5		160.6		161.7		164.0
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
	PORT OUTER	2.11	155.8	1.91	157.4	1.40	159.0	1.07	161.7
FWD/AFT	PORT INNER	3.40		3.27		2.90		2.64	
PAIRS OF	CENTRE	2.32	158.1	1.94	159.2	1.51	160.8	1.09	163.5
RECESSES	STBD INNER	2.95		2.64		2.32		1.89	
	STBD OUTER	5.14	154.2	5.01	157.3	4.43	158.1	4.11	168.4
Summed Flow, Av.Press.		15.92	156.0	14.77	158.0	12.47	159.3	10.8	161.9
FLOW BY GEMST		15.55		14.59		11.27		9.98	
MANIFOLD PRESSURE			159.9		160.7		163.1		164.2
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		24.43		21.47		18.85		16.86	
PERFORMANCE OF BEARING									
DISP. OF SHAFT AXIS in		0.0002 up		0.0000		0.0004		0.00095	
COEFF. OF FRICTION		-		-		-		-	

TABLE 5.1 CONTINUATION TABLE 5.1

INCREASING OVERLOAD, NO ORIFICES, SHAFT STOPPED
IMPOSED CONDITIONS

TEST SHEET 49 RESULTS		5E		5F		5G			
SHAFT RPM		Nil	rpm	Nil	rpm	Nil	rpm		rpm
Components of constant vertical load:									
	APPLIED LOAD	5028	lb	5366	lb	5738	lb		lb
	+ PISTON LOAD	1052	lb	1054	lb	1058	lb		lb
	= TOTAL LOAD	6080	lb	6420	lb	6796	lb		lb
	= per cent rated	115.2	%	121.9	%	128.8	%		%
WATER TEMPERATURE OUT		22.0	C	22.0	C	22.0	C		C
OTHER CONDITIONS		Fixed for the test series, given in Table *.0.							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER	0.89	46.3	0.86	46.7	0.85	46.3		
	PORT INNER	0.75	45.5	0.76	46.3	0.73	46.3		
	STBD INNER	0.54	45.7	0.54	45.7	0.52	46.1		
	STBD OUTER	0.54	46.3	0.55	46.3	0.54	46.3		
AFTER RECESSES	PORT OUTER	1.07	49.9	1.08	45.7	1.01	46.8		
	PORT INNER	1.12	46.1	1.10	46.1	1.06	46.5		
	STBD INNER	1.02	43.0	1.04	43.8	0.99	44.5		
	STBD OUTER	1.15	44.2	1.14	44.5	1.09	44.6		
Summed Flow, Av.Press.		7.08	45.3	6.97	45.6	6.79	45.9		
FLOW BY GEMST		6.05		5.99		5.78			
MANIFOLD PRESSURE			47.6		47.6		47.2		
PISTON PRESSURE			166.3		166.7		167.4		
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	0.75	166.2	0.60	167.0	0.56	168.6		
	PORT INNER	2.15		1.83		0.88			
	CENTRE	0.77	166.7	0.69	167.8	0.34	169.8		
	STBD INNER	1.35		0.99		0.43			
	STBD OUTER	3.55	163.9	3.14	167.0	1.45	167.4		
Summed Flow, Av.Press.		8.57	167.6	7.25	167.3	3.66	168.6		
FLOW BY GEMST		7.84		5.85		5.37			
MANIFOLD PRESSURE			167.8		170.5		168.5		
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		13.89		11.84		11.15			
PERFORMANCE OF BEARING									
DISP. OF SHAFT AXIS in		0.0014		0.0017		0.00185			
COEFF. OF FRICTION		-		-		-			

TABLE 6.0 TABLE 6.0

CONDITIONS FOR TEST SERIES 6
Test Sheet No.65
(Data taken from 6K Test Results)

OVERLOAD, ORIFICES, SEA WATER, SHAFT STOPPED
PRESSURES AND FLOW RATES

	RECESSES PORT			RECESSES STBD		UNIT	TOP MANIFOLD
TOP HALF BEARING	50.7	54.0	FORWARD	51.5	52.8	psig	Pressure
	1.04	1.03		1.12	1.02	igpm	165.5 psig
	Av.Press 51.4 psig			Summed Flow 8.26 igpm			Totaliser flows to recesses
	50.6	52.3	AFT	48.7	50.5	psig	
	0.74	1.09		0.89	1.33	igpm	8.88 igpm

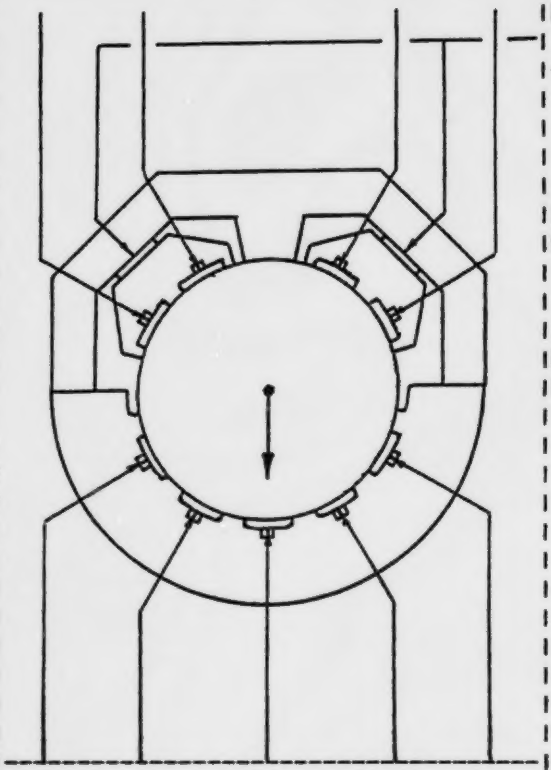
CONDITIONS IMPOSED ON BEARING

LOAD: 7207 lb (136.6%)
Steady Vertical

RPM: Nil

FLUID: Fresh water
Outlet Temperature 22.2 C

FIXED FOR ALL OF SERIES 6 TESTS:
Orifices :Yes
Check Valves:Yes
Air Vessels :No
Press. Reg. :No
Bot.modified:No
Data Logger :No
Pump: KOBE



PISTON PRESSURE 182.2 psig

PERFORMANCE OF BEARING

DISPLACEMENT OF SHAFT AXIS = 0.0020 in

COEFFICIENT OF BEARING FRICTION (f) = -

BOTTOM HALF BEARING	FIVE FORWARD/AFT PAIRS OF RECESSES					UNIT	BOTTOM MANIFOLD
	PORT OUTER	PORT INNER	CENTRE	STBD INNER	STBD OUTER		Pressure 184.6 psig
In fwd recess:	181.7		180.7		181.5	psig	
Total to pair:	0.45	1.12	0.54	0.60	1.76	igpm	
	Av.Press 181.3 psig		Summed Flow 4.47 igpm				Totaliser flows to recesses
Total flow to bearing (Gemst totaliser) = 12.23 igpm							3.35 igpm

TABLE 6.1 TABLE 6.1

INCREASING OVERLOAD, ORIFICES, SEA WATER, SHAFT STOPPED
IMPOSED CONDITIONS

TEST SHEET 65 RESULTS		6A		6B		6C		6D	
SHAFT RPM		Nil	rpm	Nil	rpm	Nil	rpm	Nil	rpm
Components of constant vertical load:									
	APPLIED LOAD	4462	lb	4597	lb	4735	lb	4872	lb
	+ PISTON LOAD	1089	lb	1099	lb	1116	lb	1123	lb
	= TOTAL LOAD	5551	lb	5696	lb	5851	lb	5995	lb
	= per cent rated	105.2	%	108.0	%	109.2	%	113.7	%
WATER TEMPERATURE OUT		22.8	C	22.8	C	22.8	C	22.2	C
OTHER CONDITIONS		Fixed for the test series, given in Table 6.0.							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
	PORT OUTER	1.01	48.3	1.02	48.3	1.02	49.1	1.02	48.3
FORWARD	PORT INNER	0.99	52.4	1.06	51.6	1.00	53.2	1.01	53.2
RECESSES	STBD INNER	1.06	49.6	1.07	49.6	1.08	50.0	1.09	50.7
	STBD OUTER	0.98	51.1	0.97	51.1	0.10	52.0	1.01	52.8
	PORT OUTER	0.71	48.7	0.73	47.9	0.73	49.1	0.73	49.1
AFTER	PORT INNER	1.05	50.4	1.22	50.4	1.08	52.3	1.08	51.1
RECESSES	STBD INNER	0.85	48.3	0.86	48.3	0.86	47.9	0.87	46.8
	STBD OUTER	1.30	52.5	1.30	51.7	1.32	51.7	1.32	50.9
Summed Flow, Av.Press.		7.95	50.2	8.23	49.9	8.10	50.7	8.13	50.4
FLOW BY GEMST		8.60		8.67		8.73		8.73	
MANIFOLD PRESSURE			159.5		160.6		163.3		162.5
FISTON PRESSURE			172.2		173.8		176.5		177.6
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
	PORT OUTER	2.04	150.6	1.87	152.6	1.87	155.8	1.74	157.9
FWD/AFT	PORT INNER	2.58		2.56		2.45		2.43	
PAIRS OF	CENTRE	2.43	159.2	2.21	161.1	2.15	165.5	1.91	167.8
RECESSES	STBD INNER	3.05		2.67		2.58		2.51	
	STBD OUTER	3.83	158.9	3.57	161.1	3.63	165.1	3.46	167.4
Summed Flow, Av.Press.		13.93	156.2	12.88	158.3	12.68	162.1	12.05	164.4
FLOW BY GEMST		15.20		13.97		13.62		13.07	
MANIFOLD PRESSURE			175.2		175.6		178.7		179.5
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		23.80		22.64		22.35		21.80	
PERFORMANCE OF BEARING									
DISP. OF SHAFT AXIS in		0.0000		0.0001		0.0002		0.00025	
COEFF. OF FRICTION		-		-		-		-	

INCREASING OVERLOAD, ORIFICES, SEA WATER, SHAFT STOPPED
- IMPOSED CONDITIONS

TEST SHEET 65 RESULTS	6E		6F		6G		6H	
SHAFT RPM	Nil	rpm	Nil	rpm	Nil	rpm	Nil	rpm
Components of constant vertical load:								
APPLIED LOAD	5046	lb	5184	lb	5372	lb	5460	lb
+ PISTON LOAD	1121	lb	1121	lb	1128	lb	1131	lb
= TOTAL LOAD	6167	lb	6305	lb	6500	lb	6591	lb
= per cent rated	116.9	%	119.5	%	123.2	%	124.9	%
WATER TEMPERATURE OUT	22.2	C	22.2	C	22.2	C	22.2	C
OTHER CONDITIONS	Fixed for the test series, given in Table 6.0.							

PRESSURES AND FLOW RATES

TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
	PORT OUTER	1.02	49.5	1.02	49.9	1.02	49.9	1.03	49.9
FORWARD	PORT INNER	1.01	53.2	1.02	52.8	1.02	52.4	1.02	53.6
RECESSES	STBD INNER	1.09	51.1	1.10	50.4	1.11	51.5	1.08	51.1
	STBD OUTER	1.01	62.5	1.01	58.4	1.01	52.4	1.02	53.2
	PORT OUTER	0.74	49.1	0.74	49.1	0.74	50.2	0.74	50.6
AFTER	PORT INNER	1.08	52.7	1.09	51.5	1.08	52.7	1.09	52.7
RECESSES	STBD INNER	0.87	46.0	0.87	46.4	0.88	46.8	0.88	47.6
	STBD OUTER	1.33	48.6	1.33	47.8	1.33	48.6	1.33	49.4
Summed Flow, Av.Press.		8.15	51.6	8.18	50.5	8.19	50.6	8.19	51.0
FLOW BY GEMST		8.73		8.81		8.81		8.88	
MANIFOLD PRESSURE			163.3		162.9		164.0		164.8
PISTON PRESSURE			177.2		177.2		178.4		178.8

BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
	PORT OUTER	1.46	159.4	1.21	161.0	0.82	165.8	0.69	168.6
FWD/AFT	PORT INNER	2.24		2.17		2.04		1.87	
PAIRS OF	CENTRE	1.50	169.0	1.27	171.3	0.84	175.6	0.67	177.6
RECESSES	STBD INNER	2.26		1.93		1.59		1.37	
	STBD OUTER	3.24	169.8	3.18	170.9	3.00	173.7	2.90	176.0
Summed Flow, Av.Press.		10.7	166.1	9.76	167.7	8.29	171.7	7.50	174.1
FLOW BY GEMST		11.01		10.18		8.26		7.29	
MANIFOLD PRESSURE			180.3		179.9		181.5		181.5

TOTAL FLOW TO BEARING

	6E	6F	6G	6H
BY GEMST TOTALISER	19.74	18.99	17.07	16.17

PERFORMANCE OF BEARING

	6E	6F	6G	6H
DISP. OF SHAFT AXIS in	0.0003	0.0004	0.0008	0.0009
COEFF. OF FRICTION	-	-	-	-

TABLE 6.1 CONTINUATION TABLE 6.1

INCREASING OVERLOAD, ORIFICES, SEA WATER, SHAFT STOPPED
IMPOSED CONDITIONS

TEST SHEET 65 RESULTS		6I		6J		6K			
SHAFT RPM		Nil	rpm	Nil	rpm	Nil	rpm		rpm
Components of constant vertical load:									
	APPLIED LOAD	5535	lb	5897	lb	6055	lb		lb
	+ PISTON LOAD	1154	lb	1159	lb	1152	lb		lb
	= TOTAL LOAD	6689	lb	7056	lb	7207	lb		lb
	= per cent rated	126.8	%	133.8	%	136.6	%		%
WATER TEMPERATURE OUT		22.2	C	22.2	C	22.2	C		C
OTHER CONDITIONS		Fixed for the test series, given in Table 6.0.							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER	1.04	50.3	1.04	51.1	1.04	50.7		
	PORT INNER	1.02	54.4	1.02	54.4	1.03	54.0		
	STBD INNER	1.11	51.9	1.11	52.3	1.12	51.5		
	STBD OUTER	1.02	54.0	1.02	54.0	1.02	52.8		
AFTER RECESSES	PORT OUTER	0.75	50.6	0.75	50.6	0.74	50.6		
	PORT INNER	1.09	53.1	1.09	53.1	1.09	52.3		
	STBD INNER	0.89	49.8	0.89	48.7	0.89	48.7		
	STBD OUTER	1.33	51.7	1.33	50.5	1.33	50.5		
Summed Flow, Av.Press.		8.25	52.0	8.25	51.8	8.26	51.4		
FLOW BY GEMST		8.88		8.88		8.88			
MANIFOLD PRESSURE			166.3		166.3		165.5		
PISTON PRESSURE			182.5		183.3		182.2		
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	0.49	178.5	0.45	182.1	0.45	181.7		
	PORT INNER	1.40		1.18		1.12			
	CENTRE	0.50	181.5	0.49	182.3	0.54	180.7		
	STBD INNER	0.95		0.62		0.60			
	STBD OUTER	2.32	181.5	2.02	182.3	1.76	181.5		
Summed Flow, Av.Press.		5.66	180.5	4.76	182.2	4.47	181.3		
FLOW BY GEMST		5.02		4.33		3.35			
MANIFOLD PRESSURE			184.6		185.4		184.6		
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		13.90		13.21		12.23			
PERFORMANCE OF BEARING									
DISP. OF SHAFT AXIS in		0.0015		0.0018		0.0020			
COEFF. OF FRICTION		-		-		-			

TABLE 7.0

TABLE 7.0

CONDITIONS FOR TEST SERIES 7 Test Sheet No.67 (Data taken from 7F Test Results)	INCREASING OVERLOAD, ORIFICES, CONSTANT SPEED PRESSURES AND FLOW RATES						
	RECESSES PORT				STBD	UNIT	TOP MANIFOLD
TOP HALF BEARING	52.0 1.03	52.0 1.02	FORWARD	53.1 1.12	51.1 1.02	psig igpm	Pressure 166.8 psig
	Av.Press 51.6 psig			Summed Flow 8.19 igpm			Totaliser flows to recesses 8.88 igpm
	51.4 0.73	51.5 1.05	AFT	48.3 0.89	53.3 1.33	psig igpm	

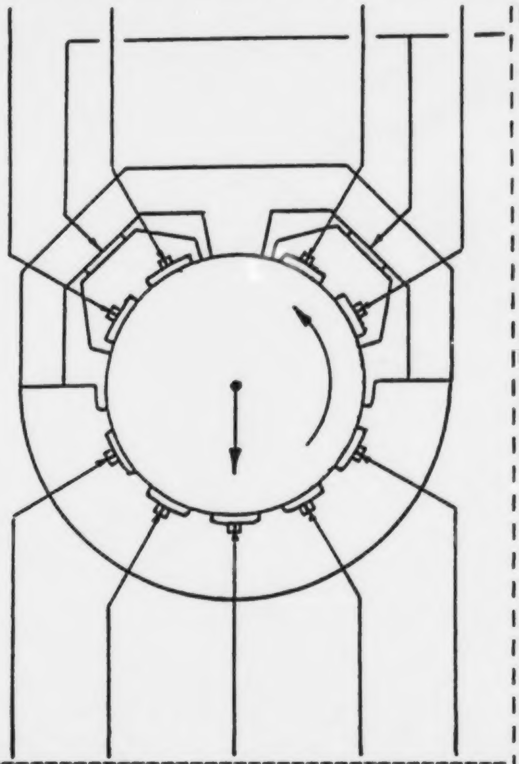
CONDITIONS IMPOSED ON BEARING

LOAD: 6747 lb (127.9%)
Steady Vertical

RPM: 544

FLUID: Fresh water
Outlet Temperature 22.0 C

FIXED FOR ALL OF SERIES 7 TESTS:
Orifices :Yes
Check Valves:Yes
Air Vessels :No
Press. Reg. :No
Bot.modified:No
Data Logger :No
Pump: KOBE



PISTON PRESSURE 181.4 psig

PERFORMANCE OF BEARING

DISPLACEMENT OF SHAFT AXIS = 0.0015 in

COEFFICIENT OF BEARING FRICTION (f) = 0.00285

BOTTOM HALF BEARING	FIVE FORWARD/AFT PAIRS OF RECESSES					UNIT	BOTTOM MANIFOLD
	PORT OUTER	PORT INNER	CENTRE	STBD INNER	STBD OUTER		Pressure 183.8 psig
In fwd recess:	175.3		179.3		179.1	psig	
Total to pair:	0.50	1.51	0.54	1.05	2.24	igpm	
	Av.Press 178.8 psig			Summed Flow 5.84 igpm			Totaliser flows to recesses 5.30 igpm
Total flow to bearing (Gemst totaliser) = 14.18 igpm							5.30 igpm

TABLE 7.1

TABLE 7.1

INCREASING OVERLOAD, ORIFICES, CONSTANT SPEED
- IMPOSED CONDITIONS

TEST SHEET 67 RESULTS		7A		7B		7C		7D	
SHAFT RPM		554	rpm	554	rpm	554	rpm	554	rpm
Components of constant vertical load:									
	APPLIED LOAD	4470	lb	4732	lb	5048	lb	5374	lb
	+ PISTON LOAD	1104	lb	1109	lb	1114	lb	1135	lb
	= TOTAL LOAD	5574	lb	5841	lb	6162	lb	6509	lb
	= per cent rated	105.7	%	110.7	%	116.8	%	123.4	%
WATER TEMPERATURE OUT		22.0	C	22.0	C	22.0	C	22.0	C
OTHER CONDITIONS		Fixed for the test series, given in Table 7.0.							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
	PORT OUTER	1.01	49.1	1.02	49.9	1.02	50.7	1.03	51.1
FORWARD	PORT INNER	1.01	50.3	1.01	50.7	1.02	51.1	1.02	52.0
RECESSES	STBD INNER	1.08	51.1	1.06	51.5	1.11	51.9	1.11	52.7
	STBD OUTER	0.98	49.1	1.00	49.9	1.01	49.9	1.03	51.1
	PORT OUTER	0.71	50.2	0.73	50.2	0.73	49.8	0.73	51.0
AFTER	PORT INNER	1.07	50.7	1.09	50.7	1.09	51.1	1.09	50.7
RECESSES	STBD INNER	0.87	46.0	0.87	45.7	0.90	46.0	0.89	47.6
	STBD OUTER	1.27	52.5	1.31	50.5	1.31	51.7	1.32	52.5
Summed Flow, Av.Press.		8.00	49.9	8.09	49.9	8.19	50.3	8.22	51.1
FLOW BY GEMST		8.53		8.67		8.74		8.81	
MANIFOLD PRESSURE			160.6		161.0		162.1		164.0
PISTON PRESSURE			174.6		175.4		176.1		179.5
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
	PORT OUTER	2.11	149.5	1.76	153.4	1.29	159.0	0.75	167.8
FWD/AFT	PORT INNER	2.73		2.40		2.32		1.93	
PAIRS OF	CENTRE	2.45	161.2	1.96	165.1	1.27	170.6	0.75	176.0
RECESSES	STBD INNER	2.97		2.47		1.94		1.40	
	STBD OUTER	3.89	161.2	3.57	165.1	3.20	169.4	2.75	176.0
Summed Flow, Av.Press.		14.5	157.3	12.16	161.2	10.02	166.3	7.58	173.3
FLOW BY GEMST		15.41		13.07		10.66		7.50	
MANIFOLD PRESSURE			177.6		177.6		178.7		181.9
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		23.94		21.74		19.40		16.31	
PERFORMANCE OF BEARING									
DISP. OF SHAFT AXIS in		0.0000		0.0002		0.0003		0.0008	
COEFF. OF FRICTION		0.00348		0.00332		0.00310		0.00291	

TABLE 7.1 CONTINUATION TABLE 7.1

INCREASING OVERLOAD, ORIFICES, CONSTANT SPEED
IMPOSED CONDITIONS

TEST SHEET 67 RESULTS	7E		7F					
SHAFT RPM	554	rpm	554	rpm		rpm		rpm
Components of constant vertical load:								
APPLIED LOAD	5462	lb	5600	lb		lb		lb
+ PISTON LOAD	1135	lb	1147	lb		lb		lb
= TOTAL LOAD	6597	lb	6747	lb		lb		lb
= per cent rated	125.1	%	127.9	%		%		%
WATER TEMPERATURE OUT	22.0	C	22.0	C		C		C
OTHER CONDITIONS	Fixed for the test series, given in Table 7.0.							

PRESSURES AND FLOW RATES

TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
	PORT OUTER	1.03	51.1	1.03	52.0				
FORWARD	PORT INNER	1.02	51.1	1.02	52.0				
RECESSES	STBD INNER	1.11	52.7	1.12	53.1				
	STBD OUTER	1.03	51.1	1.02	51.1				
	PORT OUTER	0.73	51.0	0.73	51.4				
AFTER	PORT INNER	1.09	51.5	1.05	51.5				
RECESSES	STBD INNER	0.89	47.6	0.89	48.3				
	STBD OUTER	1.32	53.3	1.33	53.3				
Summed Flow, Av.Press.		8.22	51.2	8.19	51.6				
FLOW BY GEMST		8.81		8.88					
MANIFOLD PRESSURE			164.4		166.8				
PISTON PRESSURE			179.5		181.4				

BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
	PORT OUTER	0.64	170.5	0.50	175.3				
FWD/AFT	PORT INNER	1.76		1.51					
PAIRS OF	CENTRE	0.69	177.6	0.54	179.3				
RECESSES	STBD INNER	1.22		1.05					
	STBD OUTER	2.62	176.8	2.24	179.1				
Summed Flow, Av.Press.		6.93	175.0	5.84	178.8				
FLOW BY GEMST		6.47		5.30					
MANIFOLD PRESSURE			182.7		183.8				

TOTAL FLOW TO BEARING

BY GEMST TOTALISER	15.28	14.18		

PERFORMANCE OF BEARING

DISP. OF SHAFT AXIS in	0.0009	0.0015		
COEFF. OF FRICTION	0.00284	0.00285		

TABLE 8.0 TABLE 8.0

CONDITIONS FOR TEST SERIES 8 Test Sheet No.73 (Data taken from 8BG Test Results)	INCREASING OVERLOAD, SHAFT STOPPED, PACO PUMP PRESSURES AND FLOW RATES						
	RECESSES PORT				STBD	UNIT	TOP MANIFOLD
TOP HALF BEARING	0.49	0.24	FORWARD	0.52	0.47	psig igpm	Pressure 96 psig
	Av.Press . psig		Summed Flow 3.60 igpm				Totaliser flows to recesses 4.27 igpm
	0.37	0.49	AFT	0.31	0.71	psig igpm	

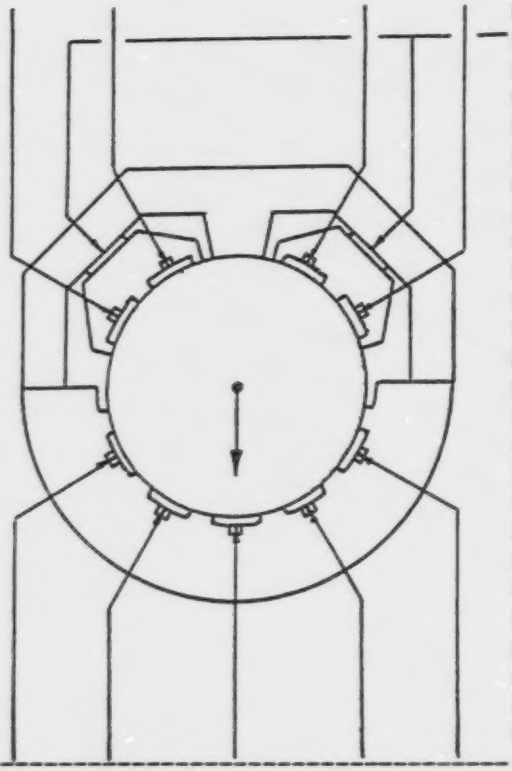
CONDITIONS IMPOSED ON BEARING

LOAD: 9948 lb (188.6%)
Steady Vertical

RPM: Nil

FLUID: Fresh water
Outlet Temperature 29.0 C

FIXED FOR ALL OF SERIES 8 TESTS:
Orifices :Yes
Check Valves:Yes
Air Vessels :No
Press. Reg. :Yes
Bot.modified:No
Data Logger :No
Pump: PACO



PISTON PRESSURE 270 psig

PERFORMANCE OF BEARING

DISPLACEMENT OF SHAFT AXIS = 0.0020 in

COEFFICIENT OF BEARING FRICTION (f) = -

	FIVE FORWARD/AFT PAIRS OF RECESSES					UNIT	BOTTOM MANIFOLD
BOTTOM HALF BEARING	PORT OUTER	PORT INNER	CENTRE	STBD INNER	STBD OUTER		Pressure 271 psig
In fwd recess:						psig	
Total to pair:	0.50	2.26	0.47	3.12	0.65	igpm	
	Av.Press . psig		Summed Flow 7.00 igpm				Totaliser flows to recesses 6.12 igpm
Total flow to bearing (Gemst totaliser) = 10.39 igpm							

TABLE 8.1 TABLE 8.1

INCREASING OVERLOAD, ORIFICES, SHAFT STOPPED, PACO PUMP IMPOSED CONDITIONS								
TEST SHEET 73 RESULTS	8AA		8AB		8AC		8AD	
SHAFT RPM	Nil	rpm	Nil	rpm	Nil	rpm	Nil	rpm
Components of constant vertical load:								
APPLIED LOAD	4462	lb	4597	lb	4735	lb	4872	lb
+ PISTON LOAD	1145	lb	1170	lb	1170	lb	1195	lb
= TOTAL LOAD	5607	lb	5767	lb	5905	lb	6067	lb
= per cent rated	106.3	%	109.3	%	111.5	%	115.0	%
WATER TEMPERATURE OUT	28.0	C	28.0	C	28.0	C	28.0	C
OTHER CONDITIONS	Fixed for the test series, given in Table 8.0.							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER	0.84		0.85		0.85		0.85	
FORWARD RECESSES PORT INNER	0.71		0.72		0.72		0.71	
FORWARD RECESSES STBD INNER	0.80		0.81		0.81		0.80	
FORWARD RECESSES STBD OUTER	0.79		0.79		0.79		0.79	
AFTER RECESSES PORT OUTER	0.67		0.68		0.68		0.67	
AFTER RECESSES PORT INNER	0.81		0.78		0.82		0.81	
AFTER RECESSES STBD INNER	0.58		0.60		0.59		0.59	
AFTER RECESSES STBD OUTER	1.03		1.05		1.03		1.03	
Summed Flow, Av.Press.	6.23		6.28		6.29		6.25	
FLOW BY GEMST	6.60		6.67		6.67		6.67	
MANIFOLD PRESSURE		110		110		110		110
PISTON PRESSURE		181		185		185		189
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER	1.96		1.89		1.85		1.78	
FWD/AFT PAIRS OF RECESSES PORT INNER	2.82		2.81		2.81		2.79	
FWD/AFT PAIRS OF RECESSES CENTRE	1.70		1.63		1.55		1.46	
FWD/AFT PAIRS OF RECESSES STBD INNER	4.06		3.98		3.93		3.89	
FWD/AFT PAIRS OF RECESSES STBD OUTER	2.51		2.53		2.54		2.43	
Summed Flow, Av.Press.	13.05		12.84		12.68		12.35	
FLOW BY GEMST	13.42		13.14		12.87		12.52	
MANIFOLD PRESSURE		180		182		186		188
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	20.02		19.81		19.54		19.19	
PERFORMANCE OF BEARING								
DISP. OF SHAFT AXIS in	0.0001		0.0001		0.0002		0.0002	
COEFF. OF FRICTION	-		-		-		-	

INCREASING OVERLOAD, ORIFICES, SHAFT STOPPED, PACO PUMP - IMPOSED CONDITIONS

TEST SHEET 73 RESULTS	8AE		8AF		8AG		8AH	
SHAFT RPM	Nil	rpm	Nil	rpm	Nil	rpm	Nil	rpm
Components of constant vertical load:								
APPLIED LOAD	5046	lb	5184	lb	5373	lb	5460	lb
+ PISTON LOAD	1214	lb	1233	lb	1258	lb	1271	lb
= TOTAL LOAD	6260	lb	6417	lb	6631	lb	6731	lb
= per cent rated	118.7	%	121.6	%	125.7	%	127.6	%
WATER TEMPERATURE OUT	28.0	C	28.0	C	28.0	C	28.0	C
OTHER CONDITIONS	Fixed for the test series, given in Table 8.0.							

PRESSURES AND FLOW RATES

TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER	0.85		0.85		0.84		0.83	
	PORT INNER	0.71		0.71		0.71		0.70	
	STBD INNER	0.80		0.80		0.79		0.79	
	STBD OUTER	0.79		0.78		0.78		0.77	
AFTER RECESSES	PORT OUTER	0.67		0.68		0.66		0.66	
	PORT INNER	0.81		0.81		0.80		0.79	
	STBD INNER	0.60		0.60		0.59		0.59	
	STBD OUTER	1.03		1.04		1.03		1.03	
Summed Flow, Av.Press.		6.26		6.27		6.20		6.16	
FLOW BY GEMST		6.60		6.67		6.60		6.60	
MANIFOLD PRESSURE			110		110		110		110
PISTON PRESSURE			192		195		199		201

BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	1.68		1.59		1.20		1.44	
	PORT INNER	2.77		2.81		2.79		2.77	
	CENTRE	1.35		1.27		1.18		1.12	
	STBD INNER	3.83		3.85		3.81		3.81	
	STBD OUTER	2.30		2.21		2.09		2.04	
Summed Flow, Av.Press.		11.93		11.73		11.07		11.18	
FLOW BY GEMST		12.11		11.90		11.56		11.35	
MANIFOLD PRESSURE			192		199		199		201

TOTAL FLOW TO BEARING

BY GEMST TOTALISER	18.71	18.57	18.16	17.95

PERFORMANCE OF BEARING

DISP. OF SHAFT AXIS in	0.00025	0.00030	0.00035	0.00050
COEFF. OF FRICTION	-	-	-	-

TABLE 8.1 CONTINUATION TABLE 8.1

INCREASING OVERLOAD, ORIFICES, SHAFT STOPPED, PACO PUMP
- IMPOSED CONDITIONS

TEST SHEET 73 RESULTS	8AI		8AJ		8AK		8AL	
SHAFT RPM	Nil	rpm	Nil	rpm	Nil	rpm	Nil	rpm
Components of constant vertical load:								
APPLIED LOAD	5735	lb	5898	lb	6048	lb	6546	lb
+ PISTON LOAD	1315	lb	1334	lb	1360	lb	1436	lb
= TOTAL LOAD	7050	lb	7232	lb	7408	lb	7982	lb
= per cent rated	133.6	%	137.1	%	140.4	%	151.3	%
WATER TEMPERATURE OUT	28.0	C	28.0	C	28.0	C	28.0	C
OTHER CONDITIONS	Fixed for the test series, given in Table 8.0.							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
PORT OUTER								
FORWARD PORT INNER								
RECESSES STBD INNER								
STBD OUTER								
PORT OUTER								
AFTER PORT INNER								
RECESSES STBD INNER								
STBD OUTER								
Summed Flow, Av.Press.								
FLOW BY GEMST								
MANIFOLD PRESSURE		110		110		112		112
PISTON PRESSURE		208		211		215		227
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
PORT OUTER								
FWD/AFT PORT INNER								
PAIRS OF CENTRE								
RECESSES STBD INNER								
STBD OUTER								
Summed Flow, Av.Press.								
FLOW BY GEMST								
MANIFOLD PRESSURE		207		211		215		227
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER								
PERFORMANCE OF BEARING								
DISP. OF SHAFT AXIS in	0.0007		0.0008		0.0009		0.0011	
COEFF. OF FRICTION	-		-		-		-	

TABLE 8.1 CONTINUATION TABLE 8.1

INCREASING OVERLOAD, ORIFICES, SHAFT STOPPED, PACO PUMP IMPOSED CONDITIONS								
TEST SHEET 73 RESULTS	8AM							
SHAFT RPM	Nil	rpm		rpm		rpm		rpm
Components of constant vertical load:								
APPLIED LOAD	4462	lb		lb		lb		lb
+ PISTON LOAD	1145	lb		lb		lb		lb
= TOTAL LOAD	5607	lb		lb		lb		lb
= per cent rated	106.3	%		%		%		%
WATER TEMPERATURE OUT	28.0	C		C		C		C
OTHER CONDITIONS	Fixed for the test series, given in Table 8.0.							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
PORT OUTER								
FORWARD PORT INNER								
RECESSES STBD INNER								
STBD OUTER								
PORT OUTER								
AFTER PORT INNER								
RECESSES STBD INNER								
STBD OUTER								
Summed Flow, Av.Press.								
FLOW BY GEMST								
MANIFOLD PRESSURE		104						
PISTON PRESSURE		181						
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
PORT OUTER								
FWD/AFT PORT INNER								
PAIRS OF CENTRE								
RECESSES STBD INNER								
STBD OUTER								
Summed Flow, Av.Press.								
FLOW BY GEMST								
MANIFOLD PRESSURE		180						
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER								
PERFORMANCE OF BEARING								
DISP. OF SHAFT AXIS in	0.0000							
COEFF. OF FRICTION	-							

TABLE 8.2

TABLE 8.2

INCREASING OVERLOAD, ORIFICES, SHAFT STOPPED, PACO PUMP

_ IMPOSED CONDITIONS

TEST SHEET 80 RESULTS	8BA		8BB		8BC		8BD	
SHAFT RPM	Nil	rpm	Nil	rpm	Nil	rpm	Nil	rpm
Components of constant vertical load:								
APPLIED LOAD	4012	lb	5046	lb	5735	lb	6546	lb
+ PISTON LOAD	1151	lb	1227	lb	1328	lb	1461	lb
= TOTAL LOAD	5163	lb	6273	lb	7063	lb	8007	lb
= per cent rated	97.9	%	118.9	%	133.9	%	151.8	%
WATER TEMPERATURE OUT	27.0	C	27.0	C	27.0	C	27.0	C
OTHER CONDITIONS	Fixed for the test series, given in Table 8.0.							

PRESSURES AND FLOW RATES

TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER	0.65		0.64		0.62		0.57	
	PORT INNER	0.29		0.29		0.28		0.26	
	STBD INNER	0.64		0.63		0.60		0.56	
	STBD OUTER	0.60		0.59		0.57		0.54	
AFTER RECESSES	PORT OUTER	0.49		0.48		0.46		0.42	
	PORT INNER	0.72		0.62		0.60		0.55	
	STBD INNER	0.41		0.42		0.40		0.37	
	STBD OUTER	0.82		0.82		0.82		0.77	
Summed Flow, Av.Press.		4.62		4.49		4.35		4.04	
FLOW BY GEMST		4.88		4.95		4.82		4.68	
MANIFOLD PRESSURE			90		91.5		92		92.5
PISTON PRESSURE			182		194		210		231

BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	2.09		1.80		1.40		0.95	
	PORT INNER	2.99		2.99		2.92		2.73	
	CENTRE	1.91		1.50		1.05		0.64	
	STBD INNER	4.26		4.06		3.91		3.80	
	STBD OUTER	2.79		2.26		1.94		1.40	
Summed Flow, Av.Press.		14.04		12.61		11.22		9.52	
FLOW BY GEMST		14.45		13.14		11.55		9.56	
MANIFOLD PRESSURE			181		194		209		231

TOTAL FLOW TO BEARING

BY GEMST TOTALISER	19.33	18.09	16.37	14.24

PERFORMANCE OF BEARING

DISP. OF SHAFT AXIS in	0.0001 up	0.00005	0.0004	0.0007
COEFF. OF FRICTION	-	-	-	-

TABLE 8.2 CONTINUATION TABLE 8.2

INCREASING OVERLOAD, ORIFICES, SHAFT STOPPED, PACO PUMP
IMPOSED CONDITIONS

TEST SHEET 80 RESULTS		8BE		8BF		8BG			
SHAFT RPM		Nil	rpm	Nil	rpm	Nil	rpm		rpm
Components of constant vertical load:									
	APPLIED LOAD	7152	lb	7650	lb	8241	lb		lb
	+ PISTON LOAD	1568	lb	1644	lb	1707	lb		lb
	= TOTAL LOAD	8720	lb	9294	lb	9948	lb		lb
	= per cent rated	165.3	%	176.2	%	188.6	%		%
WATER TEMPERATURE OUT		28.0	C	28.5	C	29.0	C		C
OTHER CONDITIONS		Fixed for the test series, given in Table 8.0.							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER	0.54		0.51		0.49			
	PORT INNER	0.24		0.24		0.24			
	STBD INNER	0.55		0.53		0.52			
	STBD OUTER	0.51		0.49		0.47			
AFTER RECESSES	PORT OUTER	0.40		0.39		0.37			
	PORT INNER	0.53		0.50		0.49			
	STBD INNER	0.33		0.33		0.31			
	STBD OUTER	0.74		0.72		0.71			
Summed Flow, Av.Press.		3.84		3.71		3.60			
FLOW BY GEMST		4.40		4.33		4.27			
MANIFOLD PRESSURE			94		94		96		
PISTON PRESSURE			248		260		270		
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	0.67		0.58		0.50			
	PORT INNER	2.49		2.37		2.26			
	CENTRE	0.50		0.47		0.47			
	STBD INNER	3.63		3.42		3.12			
	STBD OUTER	0.92		0.71		0.65			
Summed Flow, Av.Press.		8.21		7.55		7.00			
FLOW BY GEMST		7.77		6.88		6.12			
MANIFOLD PRESSURE			248		260		271		
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		12.17		11.21		10.39			
PERFORMANCE OF BEARING									
DISP. OF SHAFT AXIS in		0.0010		0.0013		0.0020			
COEFF. OF FRICTION		-		-		-			

TABLE 9.0 TABLE 9.0

CONDITIONS FOR TEST SERIES 9
Test Sheet No.81
(Data taken from 9CF Test Results)

CONSTANT OVERLOADS, INCREASING SPEEDS, PACO PUMP
PRESSURES AND FLOW RATES

	RECESSES PORT			RECESSES STBD		UNIT	TOP MANIFOLD
TOP HALF BEARING	0.52	0.24	FORWARD	0.54	0.53	psig igpm	Pressure 96 psig
	Av.Press . psig			Summed Flow 3.89 igpm			Totaliser flows to recesses 4.33 igpm
	0.40	0.54	AFT	0.32	0.80	psig igpm	

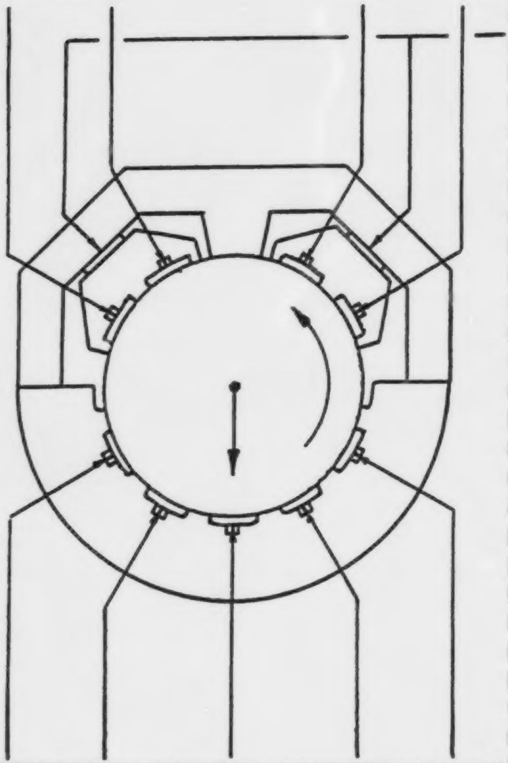
CONDITIONS IMPOSED ON BEARING

LOAD: 8713 lb
(165.2%)
Steady Vertical

RPM: 550

FLUID: Fresh water
Outlet Temperature
29.0 C

FIXED FOR ALL OF SERIES 9 TESTS:
Orifices :Yes
Check Valves:Yes
Air Vessels :No
Press. Reg. :Yes
Bot.modified:No
Data Logger :No
Pump: PACO



PISTON PRESSURE
247 psig

PERFORMANCE OF BEARING

DISPLACEMENT OF SHAFT AXIS
= 0.0010 in

COEFFICIENT OF BEARING FRICTION (f)
= 0.00211

BOTTOM HALF BEARING	FIVE FORWARD/AFT PAIRS OF RECESSES PORT OUTER	PORT INNER	CENTRE	STBD INNER	STBD OUTER	UNIT	BOTTOM MANIFOLD
In fwd recess:						psig	Pressure 248 psig
Total to pair:	0.67	2.66	0.52	3.47	0.97	igpm	
	Av.Press . psig			Summed Flow 8.29 igpm			Totaliser flows to recesses 7.91 igpm
Total flow to bearing (Gemst totaliser) = 12.24 igpm							

TABLE 9.1 TABLE 9.1

RATED LOAD, ORIFICES, INCREASING SPEED, PACO PUMP

IMPOSED CONDITIONS

TEST SHEET 81 RESULTS		9AA		9AB		9AC		9AD	
SHAFT RPM		Nil	rpm	110	rpm	220	rpm	330	rpm
Components of constant vertical load:									
	APPLIED LOAD	4463	lb	4463	lb	4463	lb	4463	lb
	+ PISTON LOAD	1157	lb	1157	lb	1157	lb	1157	lb
	= TOTAL LOAD	5620	lb	5620	lb	5620	lb	5620	lb
	= per cent rated	106.5	%	106.5	%	106.5	%	106.5	%
WATER TEMPERATURE OUT		24.0	C	26.0	C	26.0	C	27.0	C
OTHER CONDITIONS		Fixed for the test series, given in Table 9.0.							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER	0.60		0.60		0.60		0.59	
	PORT INNER	0.24		0.25		0.26		0.26	
	STBD INNER	0.59		0.59		0.59		0.58	
	STBD OUTER	0.56		0.56		0.57		0.59	
AFTER RECESSES	PORT OUTER	0.48		0.48		0.49		0.48	
	PORT INNER	0.59		0.59		0.60		0.60	
	STBD INNER	0.36		0.38		0.38		0.38	
	STBD OUTER	0.82		0.83		0.83		0.84	
Summed Flow, Av.Press.		4.24		4.28		4.32		4.32	
FLOW BY GEMST		4.61		4.68		4.75		4.75	
MANIFOLD PRESSURE			88		88		88		88
PISTON PRESSURE			183		183		183		183
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	2.00		2.02		2.02		2.04	
	PORT INNER	3.05		3.09		3.05		3.09	
	CENTRE	1.85		1.85		1.94		1.93	
	STBD INNER	4.28		4.23		4.21		4.17	
	STBD OUTER	2.90		2.82		2.82		2.75	
Summed Flow, Av.Press.		14.08		14.01		14.04		13.98	
FLOW BY GEMST		14.59		14.72		14.59		14.59	
MANIFOLD PRESSURE			182		182		181.5		182
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		19.10		19.40		19.24		19.24	
PERFORMANCE OF BEARING									
DISP. OF SHAFT AXIS in		0.0001 up		0.0001 up		0.0001 up		0.0001 up	
COEFF. OF FRICTION		-		0.00246		0.00296		0.00325	

TABLE 9.1 CONTINUATION TABLE 9.1

RATED LOAD, ORIFICES, INCREASING SPEED, PACO PUMP
IMPOSED CONDITIONS

TEST SHEET 81 RESULTS	9AE		9AF		9AG			
SHAFT RPM	440	rpm	550	rpm		rpm		rpm
Components of constant vertical load:								
APPLIED LOAD	4463	lb	4463	lb		lb		lb
+ PISTON LOAD	1157	lb	1157	lb		lb		lb
= TOTAL LOAD	5620	lb	5620	lb		lb		lb
= per cent rated	106.5	%	106.5	%		%		%
WATER TEMPERATURE OUT	27.0	C	27.0	C		C		C
OTHER CONDITIONS	Fixed for the test series, given in Table 9.0.							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER	0.59		0.59					
FORWARD RECESSES PORT INNER	0.26		0.25					
FORWARD RECESSES STBD INNER	0.58		0.59					
FORWARD RECESSES STBD OUTER	0.58		0.59					
AFTER RECESSES PORT OUTER	0.49		0.49					
AFTER RECESSES PORT INNER	0.61		0.60					
AFTER RECESSES STBD INNER	0.37		0.37					
AFTER RECESSES STBD OUTER	0.82		0.84					
Summed Flow, Av.Press.	4.30		4.31					
FLOW BY GEMST	4.75		4.75					
MANIFOLD PRESSURE		88		88				
PISTON PRESSURE		183		183				
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER	2.02		1.98					
FWD/AFT PAIRS OF RECESSES PORT INNER	3.05		2.99					
FWD/AFT PAIRS OF RECESSES CENTRE	1.96		1.95					
FWD/AFT PAIRS OF RECESSES STBD INNER	4.24		4.17					
FWD/AFT PAIRS OF RECESSES STBD OUTER	2.82		2.77					
Summed Flow, Av.Press.	14.07		13.86					
FLOW BY GEMST	14.79		14.59					
MANIFOLD PRESSURE		183		183				
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	19.54		19.24					
PERFORMANCE OF BEARING								
DISP. OF SHAFT AXIS in	0.0001 up		0.0001 up					
COEFF. OF FRICTION	0.00325		0.00334					

TABLE 9.2 TABLE 9.2

CONSTANT OVERLOAD, ORIFICES, INCREASING SPEED, PACO PUMP - IMPOSED CONDITIONS

TEST SHEET 81 RESULTS	9BA		9BB		9BC		9BD	
SHAFT RPM	Nil	rpm	110	rpm	220	rpm	330	rpm
Components of constant vertical load:								
APPLIED LOAD	5737	lb	5737	lb	5737	lb	5737	lb
+ PISTON LOAD	1321	lb	1328	lb	1328	lb	1423	lb
= TOTAL LOAD	7058	lb	7065	lb	7065	lb	7160	lb
= per cent rated	133.8	%	133.9	%	133.9	%	135.7	%
WATER TEMPERATURE OUT	28.0	C	28.0	C	28.0	C	28.0	C
OTHER CONDITIONS	Fixed for the test series, given in Table 9.0.							

PRESSURES AND FLOW RATES

TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
	PORT OUTER	0.59		0.59		0.59		0.52	
FORWARD	PORT INNER	0.24		0.25		0.25		0.24	
RECESSES	STBD INNER	0.59		0.58		0.58		0.53	
	STBD OUTER	0.56		0.57		0.57		0.51	
	PORT OUTER	0.48		0.52		0.48		0.40	
AFTER	PORT INNER	0.58		0.58		0.58		0.52	
RECESSES	STBD INNER	0.39		0.39		0.38		0.31	
	STBD OUTER	0.86		0.85		0.85		0.75	
Summed Flow, Av.Press.		4.29		4.33		4.28		3.78	
FLOW BY GEMST		4.68		4.68		4.68		4.27	
MANIFOLD PRESSURE			92		92.5		92.5		92
PISTON PRESSURE			209		210		210		225

BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
	PORT OUTER	1.33		1.29		1.29		1.38	
FWD/AFT	PORT INNER	3.07		2.90		2.90		2.82	
PAIRS OF	CENTRE	0.97		1.01		1.01		0.94	
RECESSES	STBD INNER	3.98		3.96		3.94		3.92	
	STBD OUTER	1.94		1.96		1.96		1.94	
Summed Flow, Av.Press.		11.29		11.12		11.10		11.00	
FLOW BY GEMST		11.62		11.56		11.49		12.38	
MANIFOLD PRESSURE			209		209		210		220

TOTAL FLOW TO BEARING

BY GEMST TOTALISER	16.30	16.24	16.17	16.65

PERFORMANCE OF BEARING

DISP. OF SHAFT AXIS in	0.0003	0.0003	0.0003	0.0003
COEFF. OF FRICTION	-	0.00193	0.00233	0.00253

CONSTANT OVERLOAD, ORIFICES, INCREASING SPEED, PACO PUMP
IMPOSED CONDITIONS

TEST SHEET 81 RESULTS		98E		98F		98G			
SHAFT RPM		440	rpm	550	rpm	Nil	rpm		rpm
Components of constant vertical load:									
	APPLIED LOAD	5737	lb	5737	lb	5737	lb		lb
	+ PISTON LOAD	1378	lb	1372	lb	1372	lb		lb
	= TOTAL LOAD	7115	lb	7109	lb	7109	lb		lb
	= per cent rated	134.9	%	134.8	%	134.8	%		%
WATER TEMPERATURE OUT		28.0	C	27.0	C	27.0	C		C
OTHER CONDITIONS		Fixed for the test series, given in Table 9.0.							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
	PORT OUTER	0.47		0.50		0.52			
FORWARD	PORT INNER	0.19		0.22		0.24			
RECESSES	STBD INNER	0.50		0.50		0.53			
	STBD OUTER	0.50		0.51		0.52			
	PORT OUTER	0.40		0.40		0.42			
AFTER	PORT INNER	0.52		0.52		0.53			
RECESSES	STBD INNER	0.28		0.27		0.30			
	STBD OUTER	0.70		0.70		0.73			
Summed Flow, Av.Press.		3.56		3.62		3.79			
FLOW BY GEMST		4.27		4.27		4.33			
MANIFOLD PRESSURE			88		87		87		
PISTON PRESSURE			218		217		217		
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
	PORT OUTER	1.22		1.27		1.36			
FWD/AFT	PORT INNER	2.81		2.81		2.75			
PAIRS OF	CENTRE	0.97		1.01		1.14			
RECESSES	STBD INNER	3.87		3.93		3.94			
	STBD OUTER	1.80		1.91		1.98			
Summed Flow, Av.Press.		10.67		10.93		11.17			
FLOW BY GEMST		10.60		11.21		11.35			
MANIFOLD PRESSURE			221		218		217		
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		14.87		15.48		15.68			
PERFORMANCE OF BEARING									
DISP. OF SHAFT AXIS in		0.0003		0.0003		0.0003			
COEFF. OF FRICTION		0.00254		0.00257		-			

CONSTANT OVERLOAD, ORIFICES, INCREASING SPEED, PACO PUMP
IMPOSED CONDITIONS

TEST SHEET 81 RESULTS	9CA		9CB		9CC		9CD	
SHAFT RPM	Nil	rpm	110	rpm	220	rpm	330	rpm
Components of constaht vertical load:								
APPLIED LOAD	7150	lb	7150	lb	7150	lb	–	lb
+ PISTON LOAD	1569	lb	1575	lb	1575	lb	–	lb
= TOTAL LOAD	8719	lb	8725	lb	8725	lb	–	lb
= per cent rated	165.3	%	165.4	%	165.4	%	–	%
WATER TEMPERATURE OUT	27.0	C	28.0	C	28.0	C	28.5	C
OTHER CONDITIONS	Fixed for the test series, given in Table 9.0.							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
PORT OUTER	0.46		0.45		0.44			
FORWARD PORT INNER	0.20		0.20		0.20			
RECESSES STBD INNER	0.49		0.49		0.49			
STBD OUTER	0.44		0.44		0.45			
PORT OUTER	0.36		0.36		0.36			
AFTER PORT INNER	0.44		0.45		0.45			
RECESSES STBD INNER	0.27		0.27		0.27			
STBD OUTER	0.72		0.72		0.72			
Summed Flow, Av.Press.	3.38		3.38		3.38			
FLOW BY GEMST	3.92		3.92		3.92			–
MANIFOLD PRESSURE		90		90		90		–
PISTON PRESSURE		248		249		249		–
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
PORT OUTER	0.71		0.73		0.73			
FWD/AFT PORT INNER	2.66		2.64		2.65			
PAIRS OF CENTRE	0.50		0.52		0.52			
RECESSES STBD INNER	3.70		3.65		3.65			
STBD OUTER	0.95		1.07		1.07			
Summed Flow, Av.Press.	8.52		8.61		8.62			
FLOW BY GEMST	8.26		8.39		8.26			–
MANIFOLD PRESSURE		249		249		249		–
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	12.18		12.31		12.18			
PERFORMANCE OF BEARING								
DISP. OF SHAFT AXIS in	0.0010		0.0010		0.0010		0.0010	
COEFF. OF FRICTION	–		0.00220		0.00190			

CONSTANT OVERLOAD, ORIFICES, INCREASING SPEED, PACO PUMP - IMPOSED CONDITIONS

TEST SHEET 81 RESULTS	9CE		9CF		9CG			
SHAFT RPM	440	rpm	550	rpm	Nil	rpm		rpm
Components of constant vertical load:								
APPLIED LOAD	7150	lb	7150	lb	7150	lb		lb
+ PISTON LOAD	1575	lb	1563	lb	1556	lb		lb
= TOTAL LOAD	8725	lb	8713	lb	8706	lb		lb
= per cent rated	165.4	%	165.2	%	165.0	%		%
WATER TEMPERATURE OUT	29.0	C	29.0	C	29.0	C		C
OTHER CONDITIONS	Fixed for the test series, given in Table 9.0.							

PRESSURES AND FLOW RATES

TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER	0.52		0.52		0.53			
	PORT INNER	0.24		0.24		0.24			
	STBD INNER	0.54		0.54		0.55			
	STBD OUTER	0.53		0.53		0.52			
AFTER RECESSES	PORT OUTER	0.40		0.40		0.41			
	PORT INNER	0.54		0.54		0.53			
	STBD INNER	0.32		0.32		0.32			
	STBD OUTER	0.80		0.80		0.80			
Summed Flow, Av.Press.		3.89		3.89		3.93			
FLOW BY GEMST		4.33		4.33		4.33			
MANIFOLD PRESSURE			96		96		96		
PISTON PRESSURE			249		247		246		

BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	0.67		0.67		0.67			
	PORT INNER	2.64		2.66		2.65			
	CENTRE	0.52		0.52		0.50			
	STBD INNER	3.50		3.47		3.61			
	STBD OUTER	0.99		0.97		0.92			
Summed Flow, Av.Press.		8.32		8.29		8.35			
FLOW BY GEMST		7.91		7.91		7.91			
MANIFOLD PRESSURE			248		248		247		

TOTAL FLOW TO BEARING

BY GEMST TOTALISER	12.24	12.24	12.24	

PERFORMANCE OF BEARING

DISP. OF SHAFT AXIS in	0.0010	0.0010	0.0010	
COEFF. OF FRICTION	0.00201	0.00211	-	

TABLE 10.0 TABLE 10.0

CONDITIONS FOR TEST SERIES 10
Test Sheet No.83
(Data taken from 10BF Test Results)

OVERLOADS, MODIFIED BOTTOM HALF BEARING PRESSURES AND FLOW RATES

TOP HALF BEARING	RECESSES PORT			STBD		UNIT	TOP MANIFOLD
			FORWARD			psig	Pressure
	0.66	0.35		0.62	0.64	igpm	88.5 psig
	Av.Press . psig		Summed Flow 4.73 igpm				Totaliser flows to
			AFT			psig	recesses
	0.52	0.68		0.40	0.86	igpm	5.30 igpm

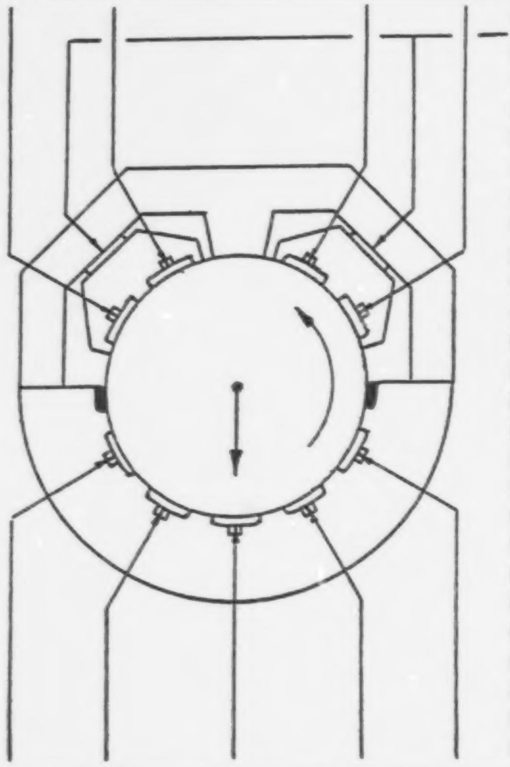
CONDITIONS IMPOSED ON BEARING

LOAD: 6787 lb (128.7%)
Steady Vertical

RPM: 550

FLUID: Fresh water
Outlet Temperature 28 C

FIXED FOR ALL OF SERIES 10 TESTS:
Orifices :Yes
Check Valves:Yes
Air Vessels :No
Press. Reg. :Yes
Bot.modified:Yes
Data Logger :No
Pump: PACO



PISTON PRESSURE 166 psig

PERFORMANCE OF BEARING

DISPLACEMENT OF SHAFT AXIS = 0.0003 in

COEFFICIENT OF BEARING FRICTION (f) = 0.00277

BOTTOM HALF BEARING	FIVE FORWARD/AFT PAIRS OF RECESSES PORT OUTER	PORT INNER	CENTRE	STBD INNER	STBD OUTER	UNIT	BOTTOM MANIFOLD
							Pressure 172 psig
In fwd recess:						psig	
Total to pair:	0.58	1.68	0.52	1.27	2.45	igpm	
	Av.Press . psig		Summed Flow 6.50 igpm				Totaliser flows to recesses
Total flow to bearing (Gemst totaliser) = 10.87 igpm							5.57 igpm

RATED LOAD, INCREASING SPEED, MODIFIED BOTTOM HALF BEARING
IMPOSED CONDITIONS

TEST SHEET 83 RESULTS		10AA		10AB		10AC		10AD	
SHAFT RPM		Nil	rpm	114	rpm	221	rpm	328	rpm
Components of constant vertical load:									
	APPLIED LOAD	4462	lb	4462	lb	4462	lb	4462	lb
	+ PISTON LOAD	854	lb	892	lb	867	lb	905	lb
	= TOTAL LOAD	5316	lb	5354	lb	5329	lb	5367	lb
	= per cent rated	100.8	%	101.5	%	101.0	%	101.7	%
WATER TEMPERATURE OUT		29.0	C	29.0	C	31.0	C	30.0	C
OTHER CONDITIONS		Fixed for the test series, given in Table 10.0							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
	PORT OUTER	0.72		0.71		0.70		0.70	
FORWARD	PORT INNER	0.39		0.37		0.41		0.41	
RECESSES	STBD INNER	0.69		0.67		0.65		0.64	
	STBD OUTER	0.69		0.68		0.67		0.67	
	PORT OUTER	0.56		0.53		0.54		0.54	
AFTER	PORT INNER	0.72		0.71		0.70		0.70	
RECESSES	STBD INNER	0.46		0.41		0.41		0.43	
	STBD OUTER	0.94		0.93		0.88		0.89	
Summed Flow, Av.Press.		5.17		5.03		4.96		4.98	
FLOW BY GEMST		5.71		5.57		5.57		5.64	
MANIFOLD PRESSURE			86.5		87.5		84.5		85.0
PISTON PRESSURE			135		141		137		143
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
	PORT OUTER	1.18		1.10		1.08		1.14	
FWD/AFT	PORT INNER	2.02		1.87		1.94		1.98	
PAIRS OF	CENTRE	0.95		0.97		0.92		1.01	
RECESSES	STBD INNER	1.91		1.89		1.85		1.81	
	STBD OUTER	2.84		2.90		2.92		2.95	
Summed Flow, Av.Press.		8.90		8.73		8.71		8.89	
FLOW BY GEMST		8.81		8.60		8.53		9.08	
MANIFOLD PRESSURE			139		137		142		142
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		14.52		14.17		14.10		14.72	
PERFORMANCE OF BEARING									
DISP. OF SHAFT AXIS in		0.0000		0.0000		0.0000		0.0000	
COEFF. OF FRICTION		-		0.00265		0.00311		0.00329	

TABLE 10.1 CONTINUATION TABLE 10.1

RATED LOAD, INCREASING SPEED, MODIFIED BOTTOM HALF BEARING
IMPOSED CONDITIONS

TEST SHEET 83 RESULTS		10AE		10AF		10AG			
SHAFT RPM		435	rpm	554	rpm	Nil	rpm		rpm
Components of constant vertical load:									
APPLIED LOAD		4462	lb	4462	lb	4462	lb		lb
+ PISTON LOAD		905	lb	905	lb	898	lb		lb
= TOTAL LOAD		5367	lb	5367	lb	5360	lb		lb
= per cent rated		101.7	%	101.7	%	101.6	%		%
WATER TEMPERATURE OUT		29.0	C	29.0	C	29.0	C		C
OTHER CONDITIONS		Fixed for the test series, given in Table 10.0							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
	PORT OUTER	0.68		0.68		0.68			
FORWARD	PORT INNER	0.35		0.35		0.35			
RECESSES	STBD INNER	0.63		0.64		0.63			
	STBD OUTER	0.66		0.67		0.66			
	PORT OUTER	0.53		0.53		0.53			
AFTER	PORT INNER	0.68		0.70		0.68			
RECESSES	STBD INNER	0.40		0.40		0.41			
	STBD OUTER	0.91		0.92		0.91			
Summed Flow, Av.Press.		4.84		4.89		4.85			
FLOW BY GEMST		5.37		5.37		5.37			
MANIFOLD PRESSURE			84.0		84.0		84.5		
PISTON PRESSURE			143		143		142		
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
	PORT OUTER	1.16		1.18		1.16			
FWD/AFT	PORT INNER	1.94		1.98		1.96			
PAIRS OF	CENTRE	1.03		1.05		0.99			
RECESSES	STBD INNER	1.93		1.89		1.89			
	STBD OUTER	2.88		2.90		2.86			
Summed Flow, Av.Press.		8.94		9.00		2.86			
FLOW BY GEMST		8.88		8.81		8.81			
MANIFOLD PRESSURE			138		138		137		
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		14.25		14.18		14.18			
PERFORMANCE OF BEARING									
DISP. OF SHAFT AXIS in		0.0000		0.0000		0.0000			
COEFF. OF FRICTION		0.00347		0.00350		-			

CONSTANT OVERLOAD, INCREASING SPEED, MODIFIED BOTTOM HALF BEARING

IMPOSED CONDITIONS

TEST SHEET 83 RESULTS		10BA		10BB		10BC		10BD	
SHAFT RPM		Nil	rpm	113	rpm	220	rpm	328	rpm
Components of constant vertical load:									
	APPLIED LOAD	5737	lb	5737	lb	5737	lb	5737	lb
	+ PISTON LOAD	1018	lb	1031	lb	1031	lb	1050	lb
	= TOTAL LOAD	6755	lb	6768	lb	6768	lb	6787	lb
	= per cent rated	128.1	%	128.3	%	128.3	%	128.7	%
WATER TEMPERATURE OUT		29	C	29	C	29	C	28	C
OTHER CONDITIONS		Fixed for the test series, given in Table 10.0							

PRESSURES AND FLOW RATES

TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
	PORT OUTER	0.70		0.69		0.69		0.65	
FORWARD	PORT INNER	0.36		0.35		0.35		0.35	
RECESSES	STBD INNER	0.66		0.63		0.65		0.62	
	STBD OUTER	0.66		0.66		0.66		0.63	
	PORT OUTER	0.55		0.53		0.54		0.51	
AFTER	PORT INNER	0.69		0.69		0.69		0.67	
RECESSES	STBD INNER	0.41		0.41		0.41		0.40	
	STBD OUTER	0.95		0.92		0.92		0.86	
Summed Flow, Av.Press.		5.02		4.88		4.91		4.69	
FLOW BY GEMST		5.44		5.44		5.44		5.23	
MANIFOLD PRESSURE			90		89.5		89.5		89
PISTON PRESSURE			161		163		163		166

BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
	PORT OUTER	0.60		0.60		0.60		0.58	
FWD/AFT	PORT INNER	1.81		1.70		1.70		1.59	
PAIRS OF	CENTRE	0.50		0.52		0.52		0.50	
RECESSES	STBD INNER	1.20		1.23		1.25		1.18	
	STBD OUTER	2.58		2.56		2.54		2.47	
Summed Flow, Av.Press.		6.69		6.61		6.61		6.32	
FLOW BY GEMST		5.85		5.85		5.92		5.50	
MANIFOLD PRESSURE			161		163		163		166

TOTAL FLOW TO BEARING

BY GEMST TOTALISER	11.29	11.29	11.36	10.73

PERFORMANCE OF BEARING

DISP. OF SHAFT AXIS in	0.00025	0.00025	0.00025	0.00030
COEFF. OF FRICTION	-	0.00205	0.00217	0.00271

TABLE 10.2 CONTINUATION TABLE 10.2

CONSTANT OVERLOAD, INCREASING SPEED, MODIFIED BOTTOM HALF BEARING
IMPOSED CONDITIONS

TEST SHEET 83 RESULTS	10BE		10BF		10BG			
SHAFT RPM	447	rpm	550	rpm	Nil	rpm		rpm
Components of constant vertical load:								
APPLIED LOAD	5737	lb	5737	lb	5737	lb		lb
+ PISTON LOAD	1043	lb	1050	lb	1056	lb		lb
= TOTAL LOAD	6780	lb	6787	lb	6793	lb		lb
= per cent rated	128.5	%	128.7	%	128.8	%		%
WATER TEMPERATURE OUT	28	C	28	C	28	C		C
OTHER CONDITIONS	Fixed for the test series, given in Table 10.0							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER	0.66		0.66		0.65			
FORWARD RECESSES PORT INNER	0.35		0.35		0.35			
FORWARD RECESSES STBD INNER	0.62		0.62		0.62			
FORWARD RECESSES STBD OUTER	0.64		0.64		0.63			
AFTER RECESSES PORT OUTER	0.51		0.52		0.51			
AFTER RECESSES PORT INNER	0.67		0.68		0.67			
AFTER RECESSES STBD INNER	0.39		0.40		0.40			
AFTER RECESSES STBD OUTER	0.87		0.86		0.86			
Summed Flow, Av.Press.	4.71		4.73		4.69			
FLOW BY GEMST	5.23		5.30		5.23			
MANIFOLD PRESSURE		89		88.5		89		
PISTON PRESSURE		165		166		167		
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER	0.58		0.58		0.64			
FWD/AFT PAIRS OF RECESSES PORT INNER	1.63		1.68		1.37			
FWD/AFT PAIRS OF RECESSES CENTRE	0.50		0.52		0.49			
FWD/AFT PAIRS OF RECESSES STBD INNER	1.20		1.27		1.14			
FWD/AFT PAIRS OF RECESSES STBD OUTER	2.47		2.45		2.64			
Summed Flow, Av.Press.	6.38		6.50		6.28			
FLOW BY GEMST	5.50		5.57		5.50			
MANIFOLD PRESSURE		165		166		167		
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	10.73		10.87		10.73			
PERFORMANCE OF BEARING								
DISP. OF SHAFT AXIS in	0.0003		0.0003		0.0003			
COEFF. OF FRICTION	0.00270		0.00277		-			

TABLE 10.3 TABLE 10.3

INCREASING OVERLOAD, SHAFT STOPPED, MODIFIED BOTTOM HALF BEARING

IMPOSED CONDITIONS

TEST SHEET 83 RESULTS	10CA		10CB		10CC		10CD	
SHAFT RPM	Nil	rpm	Nil	rpm	Nil	rpm	Nil	rpm
Components of constant vertical load:								
APPLIED LOAD	7150	lb	7150	lb	7650	lb	8063	lb
+ PISTON LOAD	1132	lb	1398	lb	1455	lb	1505	lb
= TOTAL LOAD	8282	lb	8548	lb	9105	lb	9568	lb
= per cent rated	157.0	%	162.0	%	172.6	%	181.4	%
WATER TEMPERATURE OUT	28	C	30	C	32	C	31	C
OTHER CONDITIONS	Fixed for the test series, given in Table 10.0							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
PORT OUTER	0.63		0.53		0.56		0.55	
FORWARD PORT INNER	0.34		0.24		0.26		0.24	
RECESSES STBD INNER	0.62		0.55		0.55		0.54	
STBD OUTER	0.63		0.52		0.54		0.53	
PORT OUTER	0.51		0.46		0.43		0.42	
AFTER PORT INNER	0.67		0.55		0.56		0.55	
RECESSES STBD INNER	0.40		0.32		0.33		0.31	
STBD OUTER	0.86		0.74		0.75		0.74	
Summed Flow, Av.Press.	4.68		3.93		3.98		3.88	
FLOW BY GEMST	5.23		4.40		4.54		4.47	
MANIFOLD PRESSURE		91		91.5		94.5		95.5
PISTON PRESSURE		179		221		230		238
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
PORT OUTER	0.49		1.72		1.42		1.23	
FWD/AFT PORT INNER	0.79		2.67		2.66		2.45	
PAIRS OF CENTRE	0.43		1.31		0.99		0.86	
RECESSES STBD INNER	0.99		2.19		1.98		1.78	
STBD OUTER	2.66		3.67		3.68		3.70	
Summed Flow, Av.Press.	5.36		11.56		10.73		10.02	
FLOW BY GEMST	4.47		12.04		11.01		9.98	
MANIFOLD PRESSURE		184		216		226		245
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	9.70		16.44		15.55		14.45	
PERFORMANCE OF BEARING								
DISP. OF SHAFT AXIS in	0.0007 up		0.0002 up		0.0002		0.0007	
COEFF. OF FRICTION	-		-		-		-	

TABLE 11.0

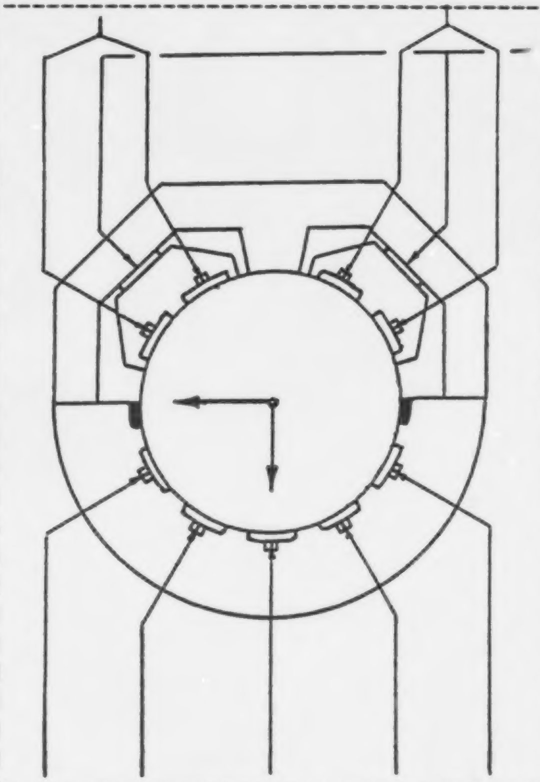
TABLE 11.0

CONDITIONS FOR TEST SERIES 11 Test Sheet No.84 (Data taken from 11E Test Results)	RATED VERTICAL/INCREASING LATERAL LOAD, SHAFT STOPPED PRESSURES AND FLOW RATES				
	RECESSES PORT		STBD	UNIT	TOP MANIFOLD
TOP HALF BEARING	35.4	FORWARD	40.6	psig	Pressure 86 psig
	2.18		1.38	igpm	
	Av.Press 38.3 psig		Summed Flow 6.16 igpm		Totaliser flows to recesses 5.16 igpm
	40.7	AFT	36.3	psig	
	1.13		1.47	igpm	

CONDITIONS IMPOSED ON BEARING

LOADS
Vertical 5275 lb (100 %)
Lateral 767 lb (14.5%)
RPM Nil
FLUID: Fresh water
Outlet Temperature 29.0 C

FIXED FOR ALL OF SERIES 11 TESTS:
Orifices :Yes
Check Valves:Yes
Air Vessels :No
Press. Reg. :Yes
Bot.modified:Yes
Data Logger :No
Pump: PACO



PISTON PRESSURE 145 psig

PERFORMANCE OF BEARING

LATERAL DISP. OF SHAFT AXIS = 0.00185 in

COEFFICIENT OF BEARING FRICTION (f) = –

BOTTOM HALF BEARING	FIVE FORWARD/AFT PAIRS OF RECESSES					UNIT	BOTTOM MANIFOLD
	PORT OUTER	PORT INNER	CENTRE	STBD INNER	STBD OUTER		Pressure 145 psig
In fwd recess:	141		132		110	psig	
Total to pair:	1.03	0.62	1.42	2.92	4.60	igpm	
	Av.Press 128 psig			Summed Flow 10.59 igpm			Totaliser flows to recesses 10.04 igpm
Total flow to bearing (Gemst totaliser) = 15.20 igpm							

TABLE 11.1

TABLE 11.1

RATED VERTICAL LOAD, INCREASING LATERAL LOAD, SHAFT STOPPED
IMPOSED CONDITIONS

TEST SHEET 84 RESULTS		11A		11B		11C		11D	
SHAFT RPM		Nil	rpm	Nil	rpm	Nil	rpm	Nil	rpm
VERTICAL LOADING:									
	APPLIED LOAD	4358	lb	4358	lb	4358	lb	4358	lb
	+ PISTON LOAD	949	lb	930	lb	923	lb	911	lb
	= TOTAL LOAD	5307	lb	5288	lb	5281	lb	5269	lb
LATERAL LOADING		-81	lb	203	lb	484	lb	626	lb
	= per cent rated	1.5	%	3.8	%	9.18	%	11.9	%
WATER TEMPERATURE OUT		30.0	C	27.0	C	27.0	C	29.0	C
OTHER CONDITIONS		Fixed for the test series, given in Table 11.0							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	2.17	37.4	2.18	36.2	2.18	35.8	2.18	35.4
	STBD INNER AND OUTER	1.35	43.0	1.36	41.0	1.38	41.0	1.39	40.6
AFTER RECESSES	PORT OUTER AND INNER	1.15	39.6	1.15	39.6	1.15	40.3	1.13	38.8
	STBD INNER AND OUTER	0.87	39.8	1.24	37.5	1.32	37.3	1.41	38.7
Summed Flow, Av.Press.		5.54	40.0	5.93	38.6	6.03	38.7	6.11	38.4
FLOW BY GEMST		5.16		5.23		5.16		5.16	
MANIFOLD PRESSURE			86		86		86		86
PISTON PRESSURE			150		147		146		144
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	1.59	126	1.23	139	1.14	141	1.12	140
	PORT INNER	2.13		1.05		0.86		0.90	
	CENTRE	1.12	144	1.37	137	1.35	136	1.48	133
	STBD INNER	1.74		2.47		2.62		2.81	
	STBD OUTER	2.37	144	3.81	125	4.17	120	4.60	115
Summed Flow, Av.Press.		8.97	138	9.93	134	10.14	132	10.91	129
FLOW BY GEMST		8.94		9.70		9.84		10.18	
MANIFOLD PRESSURE			151		147		147		145
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		14.10		14.93		15.00		15.34	
PERFORMANCE OF BEARING									
LATERAL SHAFT DISP. in		0.0000		0.0010		0.0015		0.0018	
COEFF. OF FRICTION		-		-		-		-	

TABLE 11.1 CONTINUATION TABLE 11.1

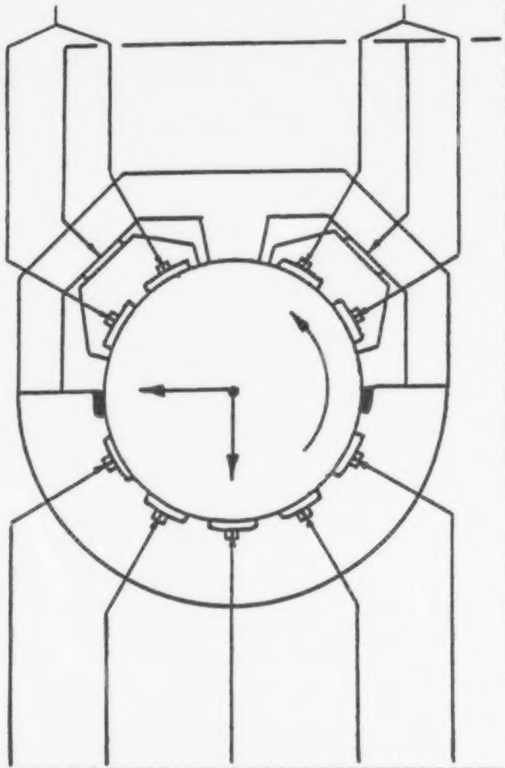
RATED VERTICAL LOAD, INCREASING LATERAL LOAD, SHAFT STOPPED
IMPOSED CONDITIONS

TEST SHEET 84 RESULTS		11E		11F					
SHAFT RPM		Nil	rpm	Nil	rpm		rpm		rpm
VERTICAL LOADING:									
	APPLIED LOAD	4358	lb	4358	lb		lb		lb
	+ PISTON LOAD	917	lb	949	lb		lb		lb
	= TOTAL LOAD	5275	lb	5307	lb		lb		lb
LATERAL LOADING		767	lb	-81	lb				
	= per cent rated	14.5	%	1.5	%		%		%
WATER TEMPERATURE OUT		29.0	C	29.0	C		C		C
OTHER CONDITIONS		Fixed for the test series, given in Table 11.0							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	2.18	35.4	2.17	35.0				
	STBD INNER AND OUTER	1.38	40.6	1.40	41.9				
AFTER RECESSES	PORT OUTER AND INNER	1.13	40.7	1.18	38.8				
	STBD INNER AND OUTER	1.47	36.3	1.00	43.4				
Summed Flow, Av.Press.		6.16	38.3	5.75	39.8				
FLOW BY GEMST		5.16		5.02					
MANIFOLD PRESSURE			86		87				
PISTON PRESSURE			145		150				
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	1.03	141	1.44	125				
	PORT INNER	0.62		2.21					
	CENTRE	1.42	132	0.95	145				
	STBD INNER	2.92		1.65					
	STBD OUTER	4.60	110	2.51	144				
Summed Flow, Av.Press.		10.59	128	8.76	145				
FLOW BY GEMST		10.04		8.74					
MANIFOLD PRESSURE			145		152				
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		15.20		13.76					
PERFORMANCE OF BEARING									
LATERAL SHAFT DISP. in		0.00185		0.0000					
COEFF. OF FRICTION		-		-					

TABLE 12.0

TABLE 12.0

CONDITIONS FOR TEST SERIES 12 Test Sheet No.85 (Data taken from 12G Test Results)	RATED VERTICAL/INCREASING LATERAL LOAD, CONSTANT RPM - PRESSURES AND FLOW RATES				
	RECESSES PORT		STBD	UNIT	TOP MANIFOLD
TOP	36.6	FORWARD	39.8	psig	Pressure
	2.17		1.37	igpm	86.2 psig
HALF	Av.Press 38.0 psig		Summed Flow 6.32 igpm		Totaliser flows to recesses
BEARING	36.9	AFT	38.7	psig	
	1.13		1.65	igpm	5.30 igpm

CONDITIONS IMPOSED ON BEARING		PISTON PRESSURE psig
LOADS: Vertical 5278 lb (100 %) Lateral 767 lb (14.5%) RPM: 222 FLUID: Fresh water Outlet Temperature 32.0 C FIXED FOR ALL OF SERIES 12 TESTS: Orifices :Yes Check Valves:Yes Air Vessels :No Press. Reg. :Yes Bot.modified:Yes Data Logger :No Pump: PACO		PERFORMANCE OF BEARING LATERAL DISP. OF SHAFT AXIS = 0.00185 in COEFFICIENT OF BEARING FRICTION (f) = 0.00458

BOTTOM HALF BEARING	FIVE FORWARD/AFT PAIRS OF RECESSES					UNIT	BOTTOM MANIFOLD
	PORT OUTER	PORT INNER	CENTRE	STBD INNER	STBD OUTER		Pressure 144.2 psig
In fwd recess:	142.7		134.7		105.8	psig	
Total to pair:	0.73	0.32	1.27	3.29	5.07	igpm	
	Av.Press 127.7 psig			Summed Flow 10.68 igpm			Totaliser flows to recesses
Total flow to bearing (Gemst totaliser) = 17.00 igpm							9.85 igpm

TABLE 12.1

TABLE 12.1

RATED VERTICAL LOAD, INCREASING LATERAL LOAD, CONSTANT RPM - IMPOSED CONDITIONS

TEST SHEET 85 RESULTS		12A		12B		12C		12D	
SHAFT RPM		Nil	rpm	221	rpm	221	rpm	222	rpm
VERTICAL LOADING:									
	APPLIED LOAD	4358	lb	4358	lb	4358	lb	4358	lb
	+ PISTON LOAD	953	lb	957	lb	957	lb	937	lb
	= TOTAL LOAD	5311	lb	5315	lb	5315	lb	5295	lb
LATERAL LOADING		0	lb	0	lb	202	lb	342	lb
	= per cent rated	0.0	%	0.0	%	3.8	%	6.5	%
WATER TEMPERATURE OUT		27.0	C	28.0	C	30.0	C	31.0	C
OTHER CONDITIONS		Fixed for the test series, given in Table 12.0							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	2.17	37.8	2.17	37.4	2.17	37.4	2.17	36.6
	STBD INNER AND OUTER	1.38	42.3	1.38	42.3	1.38	41.9	1.36	41.0
AFTER RECESSES	PORT OUTER AND INNER	1.18	39.2	1.17	40.3	1.16	40.3	1.13	40.3
	STBD INNER AND OUTER	0.96	39.5	0.98	40.2	1.13	40.6	1.30	39.5
Summed Flow, Av.Press.		5.69	39.7	5.70	40.0	5.84	40.0	5.96	39.4
FLOW BY GEMST		5.36		5.36		5.36		5.30	
MANIFOLD PRESSURE			89.4		88.6		88.2		86.6
PISTON PRESSURE			150.7		151.4		151.4		148.2
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	1.32	130.3	1.37	130.3	1.14	136.3	1.10	140.3
	PORT INNER	1.85		1.87		1.37		0.92	
	CENTRE	1.05	142.9	1.07	142.1	1.08	142.9	1.42	137.0
	STBD INNER	1.91		1.94		2.24		2.58	
	STBD OUTER	2.92	139.4	3.06	137.0	3.65	130.8	4.17	121.4
Summed Flow, Av.Press.		9.05	137.5	9.31	136.5	9.48	136.7	10.19	132.9
FLOW BY GEMST		8.95		9.30		9.30		9.72	
MANIFOLD PRESSURE			148.5		149.7		149.3		146.2
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		14.31		14.66		14.66		15.02	
PERFORMANCE OF BEARING									
LATERAL SHAFT DISP. in		0.0000		0.0000		0.0010		0.00125	
COEFF. OF FRICTION		-		0.00070		0.00108		0.00159	

RATED VERTICAL LOAD, INCREASING LATERAL LOAD, CONSTANT RPM
IMPOSED CONDITIONS

TEST SHEET 85 RESULTS	12E		12F		12G			
SHAFT RPM	222	rpm	222	rpm	222	rpm		rpm
VERTICAL LOADING:								
APPLIED LOAD	4358	lb	4358	lb	4358	lb		lb
+ PISTON LOAD	937	lb	920	lb	920	lb		lb
= TOTAL LOAD	5295	lb	5278	lb	5278	lb		lb
LATERAL LOADING	484	lb	625	lb	767	lb		lb
= per cent rated	9.2	%	11.8	%	14.5	%		%
WATER TEMPERATURE OUT	32.0	C	32.0	C	32.0	C		C
OTHER CONDITIONS	Fixed for the test series, given in Table 12.0							

PRESSURES AND FLOW RATES

TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	2.17	36.6	2.17	36.6	2.17	36.6		
	STBD INNER AND OUTER	1.36	40.2	1.36	40.2	1.37	39.8		
AFTER RECESSES	PORT OUTER AND INNER	1.14	40.7	1.14	37.3	1.13	36.9		
	STBD INNER AND OUTER	1.40	38.7	1.47	38.7	1.65	38.7		
Summed Flow, Av.Press.		6.07	39.1	6.14	38.2	6.32	38.0		
FLOW BY GEMST		5.30		5.30		5.30			
MANIFOLD PRESSURE			86.6		86.2		86.2		
PISTON PRESSURE			148.2		145.5		145.5		

BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	0.97	142.7	0.94	142.3	0.73	142.7		
	PORT INNER	0.69		0.58		0.32			
	CENTRE	1.29	137.0	1.33	135.8	1.27	134.7		
	STBD INNER	2.79		2.92		3.29			
	STBD OUTER	4.51	115.6	4.69	112.1	5.07	105.8		
Summed Flow, Av.Press.		10.25	131.8	10.46	130.1	10.68	127.7		
FLOW BY GEMST		9.79		9.85		9.85			
MANIFOLD PRESSURE			146.2		145.4		144.2		

TOTAL FLOW TO BEARING

BY GEMST TOTALISER	15.09	16.60	17.00	

PERFORMANCE OF BEARING

LATERAL SHAFT DISP. in	0.0015	0.0018	0.00185	
COEFF. OF FRICTION	0.00273	0.00464	0.00458	

TABLE 13.0

TABLE 13.0

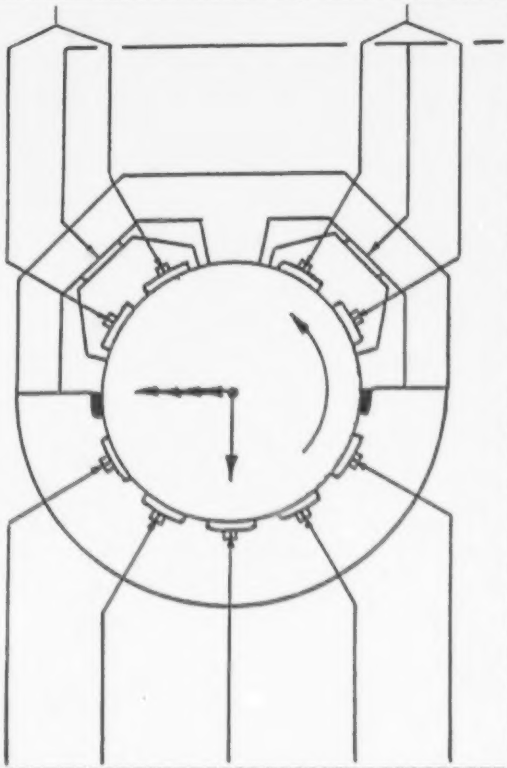
CONDITIONS FOR TEST SERIES 13 Test Sheet No.90 (Data taken from 13D-90E Results)	RATED VERTICAL/IMPULSIVE LATERAL LOAD, CONSTANT RPM - PRESSURES AND FLOW RATES				
	RECESSES			UNIT	TOP MANIFOLD
	PORT		STBD		
TOP	41	FORWARD	41	psig	Pressure
	2.67		1.27	igpm	87 psig
HALF	Av.Press 40 psig	Summed Flow 6.25 igpm			Totaliser
					flows to
BEARING	39	AFT	38	psig	recesses
	1.18		1.13	igpm	5.81 igpm

CONDITIONS
IMPOSED ON
BEARING

VERTICAL LOAD
5275 lb (100 %)
LATERAL LOAD
484 lb (9.2%)
applied at 4 Hz

RPM: 115
FLUID: Fresh water
Temps out and in
24.1 C, 24.3 C

FIXED FOR ALL OF SERIES 13 TESTS:
Orifices :Yes
Check Valves:Yes
Air Vessels :No
Press. Reg. :Yes
Bot.modified:Yes
Data Logger :Yes
Pump: PACO



PISTON PRESSURE
147 psig

PERFORMANCE
OF BEARING

DISPLACEMENT OF SHAFT AXIS:
Vertical
= 0.0000 in
Lateral
= 0.0015 in

COEFFICIENT OF BEARING FRICTION (f)
= 0.00250

BOTTOM HALF BEARING	FIVE FORWARD/AFT PAIRS OF RECESSES					UNIT	BOTTOM MANIFOLD
	PORT OUTER	PORT INNER	CENTRE	STBD INNER	STBD OUTER		Pressure 147 psig
In fwd recess:	129		133		134	psig	
Total to pair:	1.54	1.68	1.52	2.06	2.59	igpm	
	Av.Press 132 psig		Summed Flow 9.39 igpm				Totaliser flows to recesses
Total flow to bearing (Gemst totaliser) =					16.17	igpm	10.36 igpm

TABLE 13.1

TABLE 13.1

RATED VERTICAL LOAD, INCREASING LATERAL LOAD, CONSTANT RPM

IMPOSED CONDITIONS

TEST SHEET 90 RESULTS		13A-90		13A-90A		13A-90B		13A-90C	
SHAFT RPM		0	rpm	115	rpm	115	rpm	115	rpm
LOADS:	VERTICAL rated	5275	lb	5275	lb	5275	lb	5275	lb
	LATERAL	0	lb	0	lb	101	lb	202	lb
	Per cent rated	0	%	0	%	1.9	%	3.8	%
VIBRATION FREQUENCY		0	Hz	0	Hz	0	Hz	0	Hz
OTHER CONDITIONS		Fixed for the test series, given in Table 13.0							

PRESSURES AND FLOW RATES

TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	2.67	41	2.67	41	2.67	41	2.67	41
	STBD INNER AND OUTER	1.28	41	1.27	41	1.27	41	1.28	41
AFTER RECESSES	PORT OUTER AND INNER	1.19	40	1.17	40	1.18	40	1.17	40
	STBD INNER AND OUTER	1.13	37	1.13	36	1.13	38	1.14	38
Summed Flow, Av.Press		6.27	40	6.24	39	6.25	40	6.26	40
FLOW BY GEMST		5.78		5.76		5.73		5.79	
MANIFOLD PRESSURE			88		87		87		87
PISTON PRESSURE			149		147		147		147

BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	1.11	134	1.20	133	1.26	131	1.31	133
	PORT INNER	1.49		1.44		1.65		1.21	
	CENTRE	1.12	139	1.20	136	1.16	139	1.41	135
	STBD INNER	2.25		2.27		2.20		2.37	
	STBD OUTER	3.13	130	3.14	129	2.95	131	3.05	130
Summed Flow, Av.Press		9.10	134	9.25	133	8.92	134	9.35	133
FLOW BY GEMST		9.83		10.15		9.81		10.11	
MANIFOLD PRESSURE			148		147		147		145

TOTAL FLOW TO BEARING

	13A-90	13A-90A	13A-90B	13A-90C
BY GEMST TOTALISER	15.61	15.90	15.53	15.90

PERFORMANCE OF BEARING

DISPLACEMENT OF SHAFT									
AXIS:	VERTICAL	0.0000	in	0.0000	in	0.0000	in	0.0000	in
	LATERAL	0.0000	in	0.0000	in	0.0005	in	0.0010	in
COEFF. OF FRICTION (f)		-		0.00245		0.00253		0.00233	
WATER TEMPS:	OUT	31.0	C	32.7	C	32.4	C	27.0	C
	IN	31.2	C	33.0	C	32.5	C	27.1	C

TABLE 13.1 CONTINUATION TABLE 13.1

RATED VERTICAL LOAD, INCREASING LATERAL LOAD, CONSTANT RPM
IMPOSED CONDITIONS

TEST SHEET 90 RESULTS	13A-90D		13A-90E					
SHAFT RPM	115	rpm	115	rpm		rpm		rpm
LOADS: VERTICAL rated	5275	lb	5275	lb		lb		lb
LATERAL	343	lb	484	lb		lb		lb
Per cent rated	6.5	%	9.2	%		%		%
VIBRATION FREQUENCY	0	Hz	0	Hz		Hz		Hz
OTHER CONDITIONS	Fixed for the test series, given in Table 13.0							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER	2.67	41	2.67	41				
FORWARD RECESSES STBD INNER AND OUTER	1.29	40	1.29	40				
AFTER RECESSES PORT OUTER AND INNER	1.17	40	1.17	41				
AFTER RECESSES STBD INNER AND OUTER	1.15	35	1.16	34				
Summed Flow, Av.Press	6.28	39	6.29	39				
FLOW BY GEMST	5.76		5.83					
MANIFOLD PRESSURE		86		86				
PISTON PRESSURE		146		146				
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER	1.23	140	1.14	142				
PORT INNER	0.86		0.63					
CENTRE	1.51	135	1.61	131				
STBD INNER	2.64		2.84					
STBD OUTER	3.38	121	3.65	126				
Summed Flow, Av.Press	9.62	132	9.87	133				
FLOW BY GEMST	10.29		10.60					
MANIFOLD PRESSURE		146		146				
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	16.05		16.43					
PERFORMANCE OF BEARING								
DISPLACEMENT OF SHAFT AXIS: VERTICAL	0.0000	in	0.0000	in		in		in
LATERAL	0.00125	in	0.00150	in		in		in
COEFF. OF FRICTION (f)	0.00244		0.00358					
WATER TEMPS: OUT	25.5	C	24.5	C		C		C
IN	25.7	C	24.7	C		C		C

TABLE 13.2

TABLE 13.2

RATED VERTICAL LOAD, INCREASING IMPULSIVE LATERAL LOAD, CONSTANT RPM - IMPOSED CONDITIONS

TEST SHEET 90 RESULTS	13B-90B		13B-90C		13B-90D		13B-90E	
SHAFT RPM	115	rpm	115	rpm	115	rpm	115	rpm
LOADS: VERTICAL rated	5275	lb	5275	lb	5275	lb	5275	lb
LATERAL	101	lb	202	lb	343	lb	484	lb
Per cent rated	1.9	%	3.8	%	6.5	%	9.2	%
VIBRATION FREQUENCY	1	Hz	1	Hz	1	Hz	1	Hz
OTHER CONDITIONS	Fixed for the test series, given in Table 13.0							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER	2.67	41	2.65	41	2.67	42	2.67	41
FORWARD RECESSES STBD INNER AND OUTER	1.27	42	1.28	41	1.29	41	1.29	41
AFTER RECESSES PORT OUTER AND INNER	1.18	39	1.19	39	1.19	39	1.18	39
AFTER RECESSES STBD INNER AND OUTER	1.12	38	1.13	39	1.13	34	1.13	39
Summed Flow, Av.Press	6.24	40	6.25	40	6.28	39	6.27	40
FLOW BY GEMST	5.77		5.81		5.87		5.77	
MANIFOLD PRESSURE		87		87		87		87
PISTON PRESSURE		147		146		147		146
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER	1.52	122	1.58	122	1.32	121	1.69	120
PORT INNER	2.04		2.00		2.03		1.34	
CENTRE	1.18	139	1.35	136	1.42	133	1.44	135
STBD INNER	2.00		2.08		2.44		2.08	
STBD OUTER	2.44	134	2.36	138	2.46	138	2.99	120
Summed Flow, Av.Press	9.18		9.37		9.67		9.54	
FLOW BY GEMST	9.72		10.05		10.24		10.12	
MANIFOLD PRESSURE		147		146		145		145
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	15.49		15.86		16.11		15.89	
PERFORMANCE OF BEARING								
DISPLACEMENT OF SHAFT AXIS: VERTICAL	0.0000	in	0.0000	in	0.0000	in	0.0000	in
LATERAL	0.0005	in	0.0010	in	0.0013	in	0.0015	in
COEFF. OF FRICTION (f)	0.00256		0.00256		0.00250		0.00250	
WATER TEMPS: OUT	31.3	C	26.4	C	25.1	C	24.3	C
IN	31.4	C	26.5	C	25.3	C	24.4	C

TABLE 13.2 CONTINUATION TABLE 13.2

RATED VERTICAL LOAD, INCREASING IMPULSIVE LATERAL LOAD, CONSTANT RPM
IMPOSED CONDITIONS

TEST SHEET 90 RESULTS	13B-90F		13B-90G					
SHAFT RPM	116	rpm	115	rpm		rpm		rpm
LOADS: VERTICAL rated	5275	lb	5275	lb		lb		lb
LATERAL	625	lb	767	lb		lb		lb
Per cent rated	11.8	%	14.5	%		%		%
VIBRATION FREQUENCY	1	Hz	1	Hz		Hz		Hz
OTHER CONDITIONS	Fixed for the test series, given in Table 13.0							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER								
FORWARD RECESSES STBD INNER AND OUTER								
AFTER RECESSES PORT OUTER AND INNER								
AFTER RECESSES STBD INNER AND OUTER								
Summed Flow, Av.Press								
FLOW BY GEMST								
MANIFOLD PRESSURE								
PISTON PRESSURE								
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER								
PORT INNER								
CENTRE								
STBD INNER								
STBD OUTER								
Summed Flow, Av.Press								
FLOW BY GEMST								
MANIFOLD PRESSURE								
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER								
PERFORMANCE OF BEARING								
DISPLACEMENT OF SHAFT								
AXIS: VERTICAL	0.0000	in	0.0000	in		in		in
LATERAL	0.0016	in	0.0017	in		in		in
COEFF. OF FRICTION (f)	0.00272		0.00329					
WATER TEMPS: OUT	26.7	C	27.3	C		C		C
IN	26.9	C	27.5	C		C		C

RATED VERTICAL LOAD, INCREASING IMPULSIVE LATERAL LOAD, CONSTANT RPM

IMPOSED CONDITIONS

TEST SHEET 90 RESULTS	13C-90B		13C-90C		13C-90D		13C-90E	
SHAFT RPM	115	rpm	115	rpm	114	rpm	115	rpm
LOADS: VERTICAL rated	5275	lb	5275	lb	5275	lb	5275	lb
LATERAL	101	lb	202	lb	343	lb	484	lb
Per cent rated	1.9	%	3.8	%	6.5	%	9.2	%
VIBRATION FREQUENCY	2	Hz	2	Hz	2	Hz	2	Hz
OTHER CONDITIONS	Fixed for the test series, given in Table 13.0							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER	2.66	41	2.67	41	2.67	41	2.67	41
FORWARD RECESSES STBD INNER AND OUTER	1.28	42	1.28	41	1.27	42	1.29	40
AFTER RECESSES PORT OUTER AND INNER	1.18	39	1.19	39	1.19	40	1.19	38
AFTER RECESSES STBD INNER AND OUTER	1.13	37	1.14	38	1.13	38	1.13	39
Summed Flow, Av.Press	6.25	40	6.28	40	6.26	40	6.28	40
FLOW BY GEMST	5.82		5.87		5.79		5.78	
MANIFOLD PRESSURE		87		87		87		86
PISTON PRESSURE		148		147		147		146
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER	1.61	129	1.53	120	1.69	121	1.60	121
PORT INNER	1.98		1.98		1.28		1.84	
CENTRE	1.29	135	1.41	134	1.44	133	1.44	134
STBD INNER	1.98		2.21		2.05		2.46	
STBD OUTER	2.40	139	2.39	139	2.64	133	2.41	123
Summed Flow, Av.Press	9.26	134	9.52	131	9.01	129	9.75	126
FLOW BY GEMST	10.09		10.22		10.27		10.34	
MANIFOLD PRESSURE		147		145		145		146
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	15.91		16.09		16.06		16.12	
PERFORMANCE OF BEARING								
DISPLACEMENT OF SHAFT								
AXIS: VERTICAL	0.0000	in	0.0000	in	0.0000	in	0.0000	in
LATERAL	0.0005	in	0.0010	in	0.0013	in	0.0015	in
COEFF. OF FRICTION (f)	0.00256		0.00256		0.00250		0.00250	
WATER TEMPS: OUT	30.0	C	26.1	C	24.9	C	24.1	C
IN	30.1	C	26.2	C	25.1	C	24.3	C

TABLE 13.3 CONTINUATION TABLE 13.3

RATED VERTICAL LOAD, INCREASING IMPULSIVE LATERAL LOAD, CONSTANT RPM

IMPOSED CONDITIONS

TEST SHEET 90 RESULTS	13C-90F		13C-90G					
SHAFT RPM	115	rpm	115	rpm		rpm		rpm
LOADS: VERTICAL rated	5275	lb	5275	lb		lb		lb
LATERAL	625	lb	767	lb		lb		lb
Per cent rated	11.8	%	14.5	%		%		%
VIBRATION FREQUENCY	2	Hz	2	Hz		Hz		Hz
OTHER CONDITIONS	Fixed for the test series, given in Table 13.0							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER								
FORWARD RECESSES STBD INNER AND OUTER								
AFTER RECESSES PORT OUTER AND INNER								
AFTER RECESSES STBD INNER AND OUTER								
Summed Flow, Av.Press								
FLOW BY GEMST								
MANIFOLD PRESSURE								
PISTON PRESSURE								
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER								
PORT INNER								
CENTRE								
STBD INNER								
STBD OUTER								
Summed Flow, Av.Press								
FLOW BY GEMST								
MANIFOLD PRESSURE								
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER								
PERFORMANCE OF BEARING								
DISPLACEMENT OF SHAFT AXIS: VERTICAL	0.0000	in	0.0000	in		in		in
LATERAL	0.0016	in	0.0017	in		in		in
COEFF. OF FRICTION (f)	0.00269		0.00291					
WATER TEMPS: OUT	26.9	C	27.5	C		C		C
IN	27.1	C	27.7	C		C		C

TABLE 13.4

TABLE 13.4

RATED VERTICAL LOAD, INCREASING IMPULSIVE LATERAL LOAD, CONSTANT RPM
IMPOSED CONDITIONS

TEST SHEET 90 RESULTS	13D-90B		13D-90C		13D-90D		13D-90E	
SHAFT RPM	115	rpm	115	rpm	115	rpm	115	rpm
LOADS: VERTICAL rated	5275	lb	5275	lb	5275	lb	5275	lb
LATERAL	101	lb	202	lb	343	lb	484	lb
Per cent rated	1.9	%	3.8	%	6.5	%	9.2	%
VIBRATION FREQUENCY	4	Hz	4	Hz	4	Hz	4	Hz
OTHER CONDITIONS	Fixed for the test series, given in Table 13.0							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
PORT OUTER	2.65	41	2.66	41	2.67	41	2.67	41
FORWARD AND INNER								
RECESSES STBD INNER	1.28	41	1.28	40	1.28	41	1.27	41
AND OUTER								
PORT OUTER	1.19	40	1.18	40	1.19	40	1.18	39
AFTER AND INNER								
RECESSES STBD INNER	1.13	38	1.13	39	1.13	39	1.13	38
AND OUTER								
Summed Flow, Av.Press	6.25	40	6.25	40	6.27	40	6.25	40
FLOW BY GEMST	5.81		5.82		5.76		5.81	
MANIFOLD PRESSURE		87		87		87		87
PISTON PRESSURE		148		146		146		147
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
PORT OUTER	1.62	123	1.67	126	1.59	128	1.54	129
FWD/AFT PORT INNER	1.99		1.80		1.80		1.68	
PAIRS OF CENTRE	1.32	136	1.41	136	1.43	134	1.52	133
RECESSES STBD INNER	2.07		2.11		2.08		2.06	
STBD OUTER	2.38	137	2.41	137	2.47	137	2.59	134
Summed Flow, Av.Press	9.38	132	9.40	133	9.37	133	9.39	132
FLOW BY GEMST	10.21		10.35		10.29		10.36	
MANIFOLD PRESSURE		148		146		146		147
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	16.02		16.17		16.05		16.17	
PERFORMANCE OF BEARING								
DISPLACEMENT OF SHAFT								
AXIS: VERTICAL	0.0000	in	0.0000	in	0.0000	in	0.0000	in
LATERAL	0.0005	in	0.0010	in	0.0013	in	0.0015	in
COEFF. OF FRICTION (f)	0.00250		0.00275		0.00250		0.00250	
WATER TEMPS: OUT	29.1	C	25.7	C	24.7	C	24.1	C
IN	29.2	C	25.9	C	24.9	C	24.3	C

TABLE 13.4 CONTINUATION TABLE 13.4

RATED VERTICAL LOAD, INCREASING IMPULSIVE LATERAL LOAD, CONSTANT RPM

IMPOSED CONDITIONS

TEST SHEET 90 RESULTS		13D-90F		13D-90G					
SHAFT RPM		115	rpm	115	rpm		rpm		rpm
LOADS: VERTICAL rated		5275	lb	5275	lb		lb		lb
LATERAL		625	lb	767	lb		lb		lb
Per cent rated		11.8	%	14.5	%		%		%
VIBRATION FREQUENCY		4	Hz	4	Hz		Hz		Hz
OTHER CONDITIONS		Fixed for the test series, given in Table 13.0							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER								
	STBD INNER AND OUTER								
AFTER RECESSES	PORT OUTER AND INNER								
	STBD INNER AND OUTER								
Summed Flow, Av.Press									
FLOW BY GEMST									
MANIFOLD PRESSURE									
PISTON PRESSURE									
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER								
	PORT INNER								
	CENTRE								
	STBD INNER								
	STBD OUTER								
Summed Flow, Av.Press									
FLOW BY GEMST									
MANIFOLD PRESSURE									
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER									
PERFORMANCE OF BEARING									
DISPLACEMENT OF SHAFT AXIS:	VERTICAL	0.0000	in	0.0000	in		in		in
	LATERAL	0.0016	in	0.0017	in		in		in
COEFF. OF FRICTION (f)		0.00253		0.00263					
WATER TEMPS:	OUT	27.1	C	27.6	C		C		C
	IN	27.3	C	27.8	C		C		C

TABLE 14.0

TABLE 14.0

CONDITIONS FOR TEST SERIES 14 Test Sheet No101 (Data taken from 14-101D Results)	INCREASING VERTICAL OVERLOAD, SHAFT STOPPED - PRESSURES AND FLOW RATES

	RECESSES			UNIT	TOP MANIFOLD
	PORT		STBD		
	42	FORWARD	48	psig	Pressure
TOP	1.32		1.66	igpm	91 psig
HALF	Av.Press 45 psig	Summed Flow 5.76 igpm			Totaliser flows to
BEARING	45	AFT	44	psig	recesses
	1.46		1.32	igpm	5.65 igpm

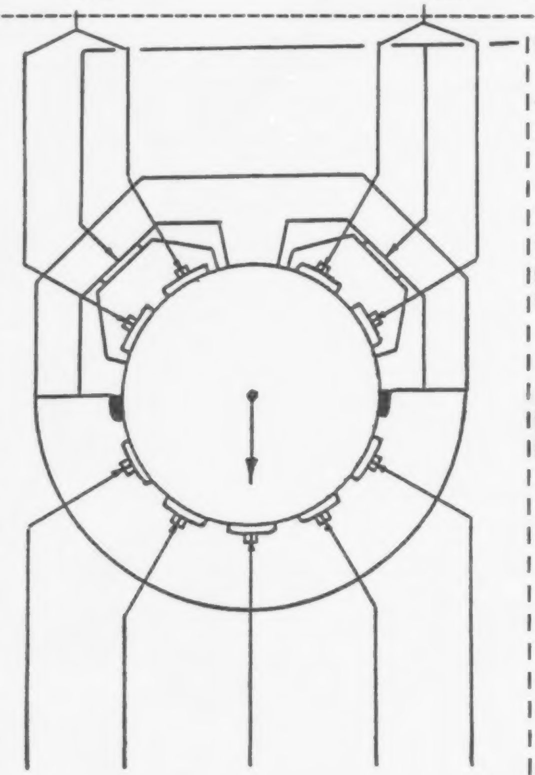
CONDITIONS IMPOSED ON BEARING

LOAD: 8252 lb (156.4%)
Steady Vertical

RPM: Nil

FLUID: Fresh water
Temps out and in
30.1 C, 30.2 C

FIXED FOR ALL OF SERIES 14 TESTS:
Orifices :Yes
Check Valves:Yes
Air Vessels :No
Press. Reg. :Yes
Bot.modified:Yes
Data Logger :Yes
Pump: PACO



PISTON PRESSURE 175 psig

PERFORMANCE OF BEARING

DISPLACEMENT OF SHAFT AXIS:
Vertical
= 0.0008 in

COEFFICIENT OF BEARING FRICTION (f)
= -

	FIVE FORWARD/AFT PAIRS OF RECESSES					UNIT	BOTTOM MANIFOLD
BOTTOM HALF BEARING	PORT OUTER	PORT INNER	CENTRE	STBD INNER	STBD OUTER		Pressure 175 psig
In fwd recess:	170		170		165	psig	
Total to pair:	0.33	0.23	0.43	0.46	3.27	igpm	
	Av.Press 168 psig		Summed Flow 4.72 igpm				Totaliser flows to recesses
Total flow to bearing (Gemst totaliser) = 10.20 igpm							4.55 igpm

INCREASING VERTICAL OVERLOAD, NO LATERAL LOAD, SHAFT STOPPED

IMPOSED CONDITIONS

TEST SHEET 101 RESULTS	14-101A		14-101B		14-101C		14-101D	
SHAFT RPM	0	rpm	0	rpm	0	rpm	0	rpm
VERTICAL LOADING:								
APPLIED LOAD	4779	lb	5565	lb	6379	lb	7145	lb
+ PISTON LOAD	911	lb	993	lb	1088	lb	1107	lb
= TOTAL LOAD	5690	lb	6558	lb	7467	lb	8252	lb
= per cent rated	107.9	%	124.3	%	141.5	%	156.4	%
OTHER CONDITIONS	Fixed for the test series, given in Table 14.0							

PRESSURES AND FLOW RATES

TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	1.40	35	1.32	38	1.32	41	1.32	42
	STBD INNER AND OUTER	1.74	40	1.73	44	1.67	47	1.66	48
AFTER RECESSES	PORT OUTER AND INNER	1.54	37	1.52	41	1.48	44	1.46	45
	STBD INNER AND OUTER	1.42	35	1.39	40	1.32	43	1.32	44
Summed Flow, Av.Press		6.10	37	5.96	41	5.79	44	5.76	45
FLOW BY GEMST		5.87		5.82		5.66		5.65	
MANIFOLD PRESSURE			88		90		91		91
PISTON PRESSURE			144		157		172		175

BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	1.11	125	0.64	142	0.33	164	0.33	170
	PORT INNER	1.79		1.52		0.25		0.23	
	CENTRE	0.93	135	0.54	151	0.45	166	0.43	170
	STBD INNER	2.25		0.80		0.51		0.46	
	STBD OUTER	2.98	133	3.07	147	3.18	162	3.27	165
Summed Flow, Av.Press		9.06	131	6.57	147	4.72	164	4.72	168
FLOW BY GEMST		8.19		6.41		4.82		4.55	
MANIFOLD PRESSURE			143		156		171		175

TOTAL FLOW TO BEARING

BY GEMST TOTALISER	14.06	12.23	10.48	10.20

PERFORMANCE OF BEARING

VERTICAL DISPLACEMENT OF SHAFT AXIS	0.0000	in	0.00015	in	0.0005	in	0.0008	in
COEFF. OF FRICTION (f)	-		-		-		-	
WATER TEMPS: OUT	27.4	C	30.9	C	30.6	C	30.1	C
IN	27.6	C	30.9	C	30.5	C	30.2	C

TABLE 15.0

TABLE 15.0

CONDITIONS FOR TEST SERIES 15 Test Sheet No107 (Data taken from 15-107D Results)	INCREASING VERTICAL OVERLOAD, DECREASING RPM PRESSURES AND FLOW RATES				
	RECESSES PORT		STBD	UNIT	TOP MANIFOLD
TOP	47	FORWARD	47	psig	Pressure
	1.36		1.68	igpm	89 psig
HALF	Av.Press 45 psig		Summed Flow 5.84 igpm		Totaliser flows to recesses
BEARING	44	AFT	42	psig	
	1.48		1.32	igpm	5.77 igpm

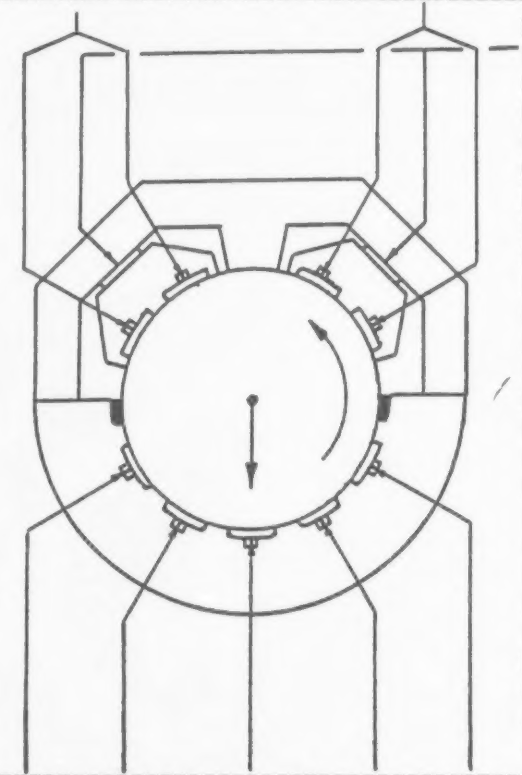
CONDITIONS IMPOSED ON BEARING

LOAD: 9691 lb (183.7%)
Steady Vertical

RPM: 70

FLUID: Fresh water
Temps out and in
32.7 C, 32.9 C

FIXED FOR ALL OF SERIES 15 TESTS:
Orifices :Yes
Check Valves:Yes
Air Vessels :No
Press. Reg. :Yes
Bot.modified:Yes
Data Logger :Yes
Pump: PACO



PISTON PRESSURE 170 psig

PERFORMANCE OF BEARING

DISPLACEMENT OF SHAFT AXIS:
Vertical:
= 0.0017 in

COEFFICIENT OF BEARING FRICTION (f)
= 0.00168

	FIVE FORWARD/AFT PAIRS OF RECESSES					UNIT	BOTTOM MANIFOLD
BOTTOM HALF BEARING	PORT OUTER	PORT INNER	CENTRE	STBD INNER	STBD OUTER		Pressure 169 psig
In fwd recess:	152		164		159	psig	
Total to pair:	0.55	1.41	0.51	0.79	3.21	igpm	
	Av.Press 158 psig		Summed Flow 6.47 igpm				Totaliser flows to recesses
Total flow to bearing (Gemst totaliser) = 11.58 igpm							5.81 igpm

TABLE 15.1

TABLE 15.1

INCREASING VERTICAL OVERLOAD, NO LATERAL LOAD, DECREASING RPM IMPOSED CONDITIONS

TEST SHEET 107 RESULTS		15-107A		15-107B		15-107C		15-107D	
SHAFT RPM		104	rpm	102	rpm	90	rpm	70	rpm
VERTICAL LOADING:									
	APPLIED LOAD	4358	lb	6061	lb	7765	lb	8616	lb
	+ PISTON LOAD	930	lb	974	lb	1024	lb	1075	lb
	= TOTAL LOAD	5288	lb	7035	lb	8789	lb	9691	lb
	= per cent rated	100.2	%	133.4	%	166.6	%	183.7	%
OTHER CONDITIONS		Fixed for the test series, given in Table 15.0							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	1.34	42	1.40	43	1.38	45	1.36	47
	STBD INNER AND OUTER	1.65	42	1.73	43	1.71	44	1.68	47
AFTER RECESSES	PORT OUTER AND INNER	1.44	40	1.52	39	1.50	42	1.48	44
	STBD INNER AND OUTER	1.29	37	1.37	38	1.35	40	1.32	42
Summed Flow, Av.Press		5.72	40	6.02	41	5.96	43	5.84	45
FLOW BY GEMST		5.67		5.99		5.89		5.77	
MANIFOLD PRESSURE			83		89		89		89
PISTON PRESSURE			147		154		162		170
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	1.24	128	0.96	132	0.71	145	0.55	152
	PORT INNER	1.92		1.82		1.67		1.41	
	CENTRE	1.08	140	0.85	144	0.60	154	0.51	164
	STBD INNER	1.36		1.11		0.95		0.79	
	STBD OUTER	3.25	136	3.05	143	2.98	152	3.21	159
Summed Flow, Av.Press		8.85	135	7.79	140	6.91	150	6.47	158
FLOW BY GEMST		8.66		8.20		7.18		5.81	
MANIFOLD PRESSURE			147		153		161		169
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		14.53		14.19		13.07		11.58	
PERFORMANCE OF BEARING									
VERTICAL DISPLACEMENT OF SHAFT AXIS		0.0001	in	0.0003	in	0.0011	in	0.0017	in
COEFF. OF FRICTION (f)		0.00239		0.00182		0.00162		0.00168	
WATER TEMPS:	OUT	33.2	C	31.8	C	31.7	C	32.7	C
	IN	33.4	C	31.9	C	31.9	C	32.9	C

TABLE 16.0 TABLE 16.0

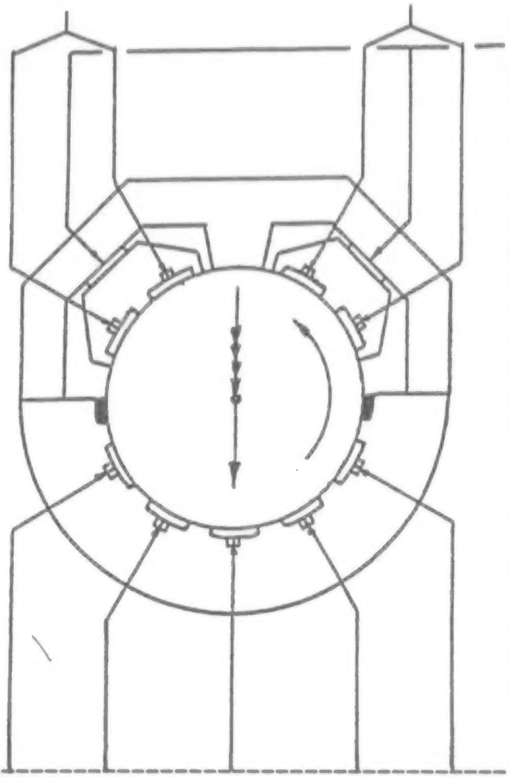
CONDITIONS FOR TEST SERIES 16 Test Sheet No107 (Data taken from 16C-107J Results)	CONSTANT IMPULSIVE VERTICAL OVERLOAD, CONSTANT RPM PRESSURES AND FLOW RATES				
	RECESSES PORT		STBD	UNIT	TOP MANIFOLD
TOP HALF BEARING	43	FORWARD	44	psig	Pressure 85 psig
	1.34		1.66	igpm	
	Av.Press 42 psig		Summed Flow 5.77 igpm		Totaliser flows to recesses 5.79 igpm
	40	AFT	40	psig	
	1.45		1.32	igpm	

CONDITIONS IMPOSED ON BEARING

LOAD: Vertical
Steady 5338 lb
Impulse 8744 lb
Frequency 4 Hz
RPM: 101

FLUID: Fresh water
Temps out and in
32.2 C, 32.4 C

FIXED FOR ALL OF SERIES 16 TESTS:
Orifices :Yes
Check Valves:Yes
Air Vessels :No
Press. Reg. :Yes
Bot.modified:Yes
Data Logger :Yes
Pump: PACO



PISTON PRESSURE 155 psig

PERFORMANCE OF BEARING

DISPLACEMENT OF SHAFT AXIS:
Vertical:
= 0.0010

COEFFICIENT OF BEARING FRICTION (f)
= 0.00143

BOTTOM HALF BEARING	FIVE FORWARD/AFT PAIRS OF RECESSES					UNIT	BOTTOM MANIFOLD
	PORT OUTER	PORT INNER	CENTRE	STBD INNER	STBD OUTER		Pressure 149 psig
In fwd recess:	128		145		138	psig	
Total to pair:	1.25	1.85	0.93	1.22	3.16	igpm	
	Av.Press 137 psig			Summed Flow 8.41 igpm			Totaliser flows to recesses
Total flow to bearing (Gemst totaliser) = 14.36 igpm							8.57 igpm

TABLE 16.1 TABLE 16.1

RATED VERTICAL LOAD, NO LATERAL LOAD, SHAFT STOPPED AND RUNNING
IMPOSED CONDITIONS

TEST SHEET 107 RESULTS	16A-107A	16A-107B		
SHAFT RPM	0 rpm	104 rpm	rpm	rpm
VERTICAL LOADING:				
APPLIED LOAD	4358 lb	4358 lb	lb	lb
+ PISTON LOAD	930 lb	930 lb	lb	lb
= TOTAL LOAD	5288 lb	5288 lb	lb	lb
= per cent rated	100.2 %	100.2 %	%	%
OTHER CONDITIONS	Fixed for the test series, given in Table 16.0			

PRESSURES AND FLOW RATES

TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	1.42	41	1.34	42				
	STBD INNER AND OUTER	1.74	41	1.66	42				
AFTER RECESSES	PORT OUTER AND INNER	1.55	39	1.44	40				
	STBD INNER AND OUTER	1.40	37	1.29	37				
Summed Flow, Av.Press		6.11	42	5.73	40				
FLOW BY GEMST		5.95		5.67					
MANIFOLD PRESSURE			88		83				
PISTON PRESSURE			147		147				

BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	1.19	127	1.24	128				
	PORT INNER	1.87		1.92					
	CENTRE	1.03	139	1.08	140				
	STBD INNER	1.33		1.36					
	STBD OUTER	3.01	137	3.25	136				
Summed Flow, Av.Press		8.43	134	8.85	135				
FLOW BY GEMST		8.57		8.66					
MANIFOLD PRESSURE			147		147				

TOTAL FLOW TO BEARING

BY GEMST TOTALISER	14.52	14.33		

PERFORMANCE OF BEARING

VERTICAL DISPLACEMENT OF SHAFT AXIS	0.0001 in	0.0001 in	in	in
COEFF. OF FRICTION (f)	-	0.00239		
WATER TEMPS: OUT	29.4 C	33.2 C	C	C
IN	29.7 C	33.4 C	C	C

TABLE 16.2 TABLE 16.2

CONSTANT IMPULSIVE VERTICAL OVERLOAD, NO LATERAL LOAD, CONSTANT RPM - IMPOSED CONDITIONS

TEST SHEET 107 RESULTS	16B-107C		16B-107D		16B-107E		16B-107F	
SHAFT RPM	102	rpm	103	rpm	103	rpm	103	rpm
LOAD: STEADY APPLIED	4358	lb	4358	lb	4358	lb	4358	lb
PEAK APPLIED	6061	lb	6061	lb	6061	lb	6061	lb
+ PISTON LOAD	967	lb	942	lb	923	lb	936	lb
= TOTAL STEADY LOAD	5325	lb	5300	lb	5281	lb	5294	lb
= TOTAL PEAK LOAD	7028	lb	7003	lb	6984	lb	6997	lb
= per cent rated	133.2	%	132.8	%	132.4	%	132.6	%
VIBRATION FREQUENCY	0	Hz	1	Hz	2	Hz	4	Hz
OTHER CONDITIONS	Fixed for the test series, given in Table 16.0							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER	1.40	43	1.37	42	1.37	41	1.37	42
FORWARD RECESSES STBD INNER AND OUTER	1.73	43	1.71	41	1.71	41	1.71	41
AFTER RECESSES PORT OUTER AND INNER	1.51	40	1.49	38	1.49	39	1.49	39
AFTER RECESSES STBD INNER AND OUTER	1.37	39	1.35	38	1.35	37	1.35	38
Summed Flow, Av.Press	6.01	41	5.92	40	5.95	40	5.92	40
FLOW BY GEMST	5.95		5.86		5.82		5.83	
MANIFOLD PRESSURE		88		86		86		86
PISTON PRESSURE		153		149		146		148
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER	1.01	134	1.39	128	1.20	128	1.16	126
PORT INNER	1.79		1.84		1.91		1.90	
CENTRE	0.87	143	1.06	137	1.00	140	0.97	141
STBD INNER	1.08		1.29		1.43		1.37	
STBD OUTER	3.09	143	3.05	138	3.10	136	3.06	137
Summed Flow, Av.Press	7.84	140	8.63	134	8.64	135	8.46	135
FLOW BY GEMST	8.20		8.89		8.56		8.51	
MANIFOLD PRESSURE		153		149		147		147
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	14.15		14.75		14.38		14.34	
PERFORMANCE OF BEARING								
VERT. DISP. OF SHAFT	0.0003	in	0.0003	in	0.0003	in	0.0003	in
COEFF. OF FRICTION (f)	0.00173		-		0.00174		-	
WATER TEMPS: OUT	31.8	C	31.6	C	31.6	C	31.6	C
IN	32.1	C	31.7	C	31.8	C	31.8	C

TABLE 16.3 TABLE 16.3

CONSTANT IMPULSIVE VERTICAL OVERLOAD, NO LATERAL LOAD, CONSTANT RPM

IMPOSED CONDITIONS

TEST SHEET 107 RESULTS	16C-107G		16C-107H		16C-107I		16C-107J	
SHAFT RPM	90	rpm	101	rpm	101	rpm	101	rpm
LOAD:STEADY APPLIED	4358	lb	4358	lb	4358	lb	4358	lb
PEAK APPLIED	7764	lb	7764	lb	7764	lb	7764	lb
+ PISTON LOAD	1025	lb	930	lb	949	lb	980	lb
= TOTAL STEADY LOAD	5383	lb	5282	lb	5307	lb	5338	lb
= TOTAL PEAK LOAD	8789	lb	8694	lb	8713	lb	8744	lb
= per cent rated	166.6	%	164.8	%	165.2	%	165.8	%
VIBRATION FREQUENCY	0	Hz	1	Hz	2	Hz	4	Hz
OTHER CONDITIONS	Fixed for the test series, given in Table 16.0							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER	1.38	45	1.34	42	1.34	42	1.34	43
FORWARD RECESSES STBD INNER AND OUTER	1.71	45	1.68	42	1.67	42	1.66	44
AFTER RECESSES PORT OUTER AND INNER	1.50	41	1.48	40	1.45	42	1.45	40
AFTER RECESSES STBD INNER AND OUTER	1.35	41	1.32	38	1.32	38	1.32	40
Summed Flow, Av.Press	5.94	43	5.82	40	5.78	41	5.77	42
FLOW BY GEMST	5.91		5.68		5.65		5.79	
MANIFOLD PRESSURE		89		85		85		85
PISTON PRESSURE		162		147		150		155
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
PORT OUTER	0.71	141	1.27	127	1.26	140	1.25	128
FWD/AFT PORT INNER	1.63		1.96		1.87		1.85	
PAIRS OF CENTRE	0.61	156	1.01	146	0.68	140	0.93	145
RECESSES STBD INNER	1.00		1.42		1.46		1.22	
STBD OUTER	2.98	151	3.10	137	3.08	136	3.16	138
Summed Flow, Av.Press	6.93	149	8.76	137	8.35	139	8.41	137
FLOW BY GEMST	7.02		8.70		7.69		8.57	
MANIFOLD PRESSURE		162		148		154		149
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	12.93		14.38		13.34		14.36	
PERFORMANCE OF BEARING								
VERT. DISP. OF SHAFT	0.0011	in	0.0010	in	0.0010	in	0.0010	in
COEFF. OF FRICTION (f)	0.00162		0.00132		0.00156		0.00143	
WATER TEMPS: OUT	31.8	C	31.9	C	32.1	C	32.2	C
IN	32.0	C	32.1	C	32.2	C	32.4	C

TABLE 17.0

TABLE 17.0

CONDITIONS FOR TEST SERIES 17	IMPULSIVE VERTICAL OVERLOAD WITH AIR VESSELS PRESSURES AND FLOW RATES				
Sheets 120 - 127	PORT	RECESSES	STBD	UNIT	TOP MANIFOLD
TOP HALF BEARING		FORWARD		psig igpm	Pressure psig
	Av.Press . psig		Summed Flow igpm		Totaliser flows to recesses igpm
		AFT		psig igpm	

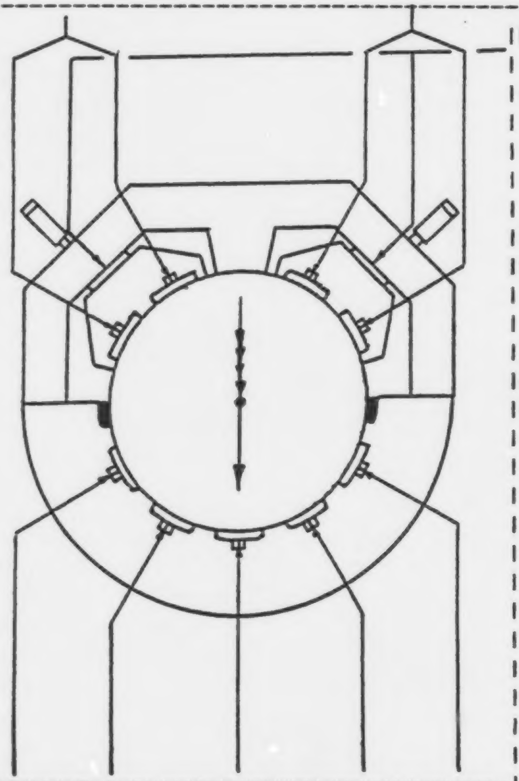
CONDITIONS IMPOSED ON BEARING

LOAD: Vertical
Steady 5275 lb
Impulse 10385 lb

RPM: Nil

FLUID: Fresh water
Outlet Temperature . C

FIXED FOR ALL OF SERIES 17 TESTS:
Orifices :Yes
Check Valves:Yes
Air Vessels :Yes
Press. Reg. :Yes
Bot.modified:Yes
Data Logger :Yes
Pump: PACO



PISTON PRESSURE psig

PERFORMANCE OF BEARING

DISPLACEMENT OF SHAFT AXIS
= in

COEFFICIENT OF BEARING FRICTION (f)
= -

BOTTOM HALF BEARING	FIVE FORWARD/AFT PAIRS OF RECESSES					UNIT	BOTTOM MANIFOLD
	PORT OUTER	PORT INNER	CENTRE	STBD INNER	STBD OUTER		Pressure psig
In fwd recess:						psig	
Total to pair:						igpm	
	Av.Press . psig		Summed Flow . igpm				Totaliser flows to recesses . igpm

Total flow to bearing (Gemst totaliser) = igpm

TABLE 17.1

TABLE 17.1

IMPULSIVE VERTICAL OVERLOAD WITH AIR VESSELS OF INCREASING SIZE
5275 lb VERTICAL RATED LOAD, 5110 lb OVERLOAD (96.9% RATED)

OSCILLOSCOPE READINGS OF SHAFT MOVEMENT RELATIVE TO BEARING CENTRE

TEST SHEET 120	WITHOUT AIR VESSELS TOTAL VOLUME = 0.0000 CUBIC INS; SPEED = 0 RPM			
FREQUENCY OF IMPULSES	1 Hz	2 Hz	4 Hz	5 Hz
PEAK SHAFT Upper	0.0008 in	0.0008 in	0.00065 in	0.0006 in
DISPLACEMENTS Lower	0.0015 in	0.0013 in	0.0012 in	0.0011 in
Displacement Damping	46.7 %	38.5 %	45.8 %	45.5 %
AMPLITUDE	0.0007 in	0.0005 in	0.00055 in	0.0005 in
MEAN POSITION BELOW	0.00115 in	0.00115 in	0.00093 in	0.00085 in
TEST SHEET 123	FOUR AIR VESSELS, EACH 1" LONG x 5/16" DIAMETER TOTAL VOLUME = 0.3068 CUBIC INS; SPEED = 0 RPM			
FREQUENCY OF IMPULSES	1 Hz	2 Hz	4 Hz	5 Hz
PEAK SHAFT Upper	0.0009 in	0.0009 in	0.00085 in	0.00075 in
DISPLACEMENTS Lower	0.0016 in	0.0014 in	0.0014 in	0.0013 in
Displacement Damping	43.7 %	35.7 %	39.3 %	42.3 %
AMPLITUDE	0.0007 in	0.0005 in	0.00055 in	0.00055 in
MEAN POSITION BELOW	0.00125 in	0.00115 in	0.00113 in	0.00103 in
TEST SHEET 125	FOUR AIR VESSELS, EACH 2" LONG x 5/16" DIAMETER TOTAL VOLUME = 0.6136 CUBIC INS; SPEED = 0 RPM			
FREQUENCY OF IMPULSES	1 Hz	2 Hz	4 Hz	5 Hz
PEAK SHAFT Upper	0.00095 in	0.0009 in	0.0008 in	0.0007 in
DISPLACEMENTS Lower	0.0016 in	0.0015 in	0.0014 in	0.0013 in
Displacement Damping	40.6 %	40.0 %	42.9 %	46.2 %
AMPLITUDE	0.00065 in	0.0006 in	0.0006 in	0.0006 in
MEAN POSITION BELOW	0.00128 in	0.0012 in	0.0011 in	0.0010 in
TEST SHEET 127	FOUR AIR VESSELS, EACH 3" LONG x 5/16" DIAMETER TOTAL VOLUME = 0.9204 CUBIC INS; SPEED = 0 RPM			
FREQUENCY OF IMPULSES	1 Hz	2 Hz	4 Hz	5 Hz
PEAK SHAFT Upper	0.0008 in	0.0007 in	0.0007 in	0.0006 in
DISPLACEMENTS Lower	0.0014 in	0.0013 in	0.00115 in	0.0011 in
Displacement Damping	42.9 %	46.2 %	39.1 %	45.5 %
AMPLITUDE	0.0006 in	0.0006 in	0.00045 in	0.0005 in
MEAN POSITION BELOW	0.0011 in	0.0010 in	0.00093 in	0.00085 in

Displacement Damping is defined as the ratio (Lower - Upper)/Lower x 100%. It is calculated from the tabulated values of the peak shaft displacement.

TABLE 20.00 TABLE 20.00

CONDITIONS FOR TEST SERIES 20
Test Sheets Nos. 158 to 167. Data from 20.0A (A)

LOAD/FLOAT/PRESSURE/FLOW RELATIONSHIP INVESTIGATION
PRESSURES AND FLOW RATES

	RECESSES PORT		RECESSES STBD	UNIT	TOP MANIFOLD
TOP HALF BEARING	37.5	FORWARD	37.4	psig	Pressure 89.6 psig
	1.29		1.47	igpm	
	Av.Press 37.8 psig	Summed Flow 5.25 igpm			Totaliser flows to recesses 5.63 igpm
	35.6	AFT	40.9	psig	
	1.37		1.12	igpm	

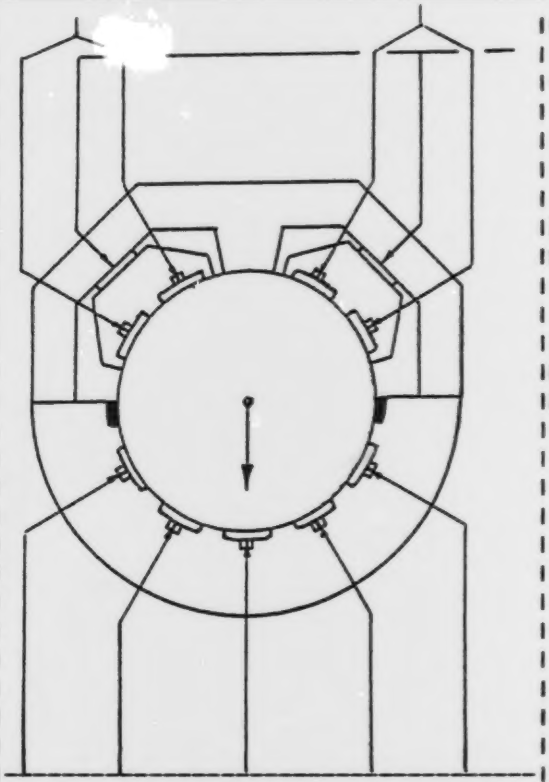
CONDITIONS IMPOSED ON BEARING

LOAD: 5307 lb (100.6%)
Steady Vertical

RPM: Nil

FLUID: Fresh water
Outlet Temperature 28.9 C

FIXED FOR ALL OF SERIES 20 TESTS:
Orifices :Yes
Check Valves:Yes
Air Vessels :No
Press. Reg. :Yes
Bot.modified:Yes
Data Logger :Yes
Pump: PACO



PISTON PRESSURE 150 psig

PERFORMANCE OF BEARING

DISPLACEMENT OF SHAFT AXIS
= -0.005 in

COEFFICIENT OF BEARING FRICTION (f)
= -

FIVE FORWARD/AFT PAIRS OF RECESSES

BOTTOM HALF BEARING	PORT OUTER	PORT INNER	CENTRE	STBD INNER	STBD OUTER	UNIT	BOTTOM MANIFOLD
In fwd recess:	142.0		143.0		134.0	psig	Pressure 153.0 psig
Total to pair:	1.36	1.36	1.10	1.54	3.73	igpm	
	Av.Press 139.7 psig		Summed Flow 9.09 igpm				Totaliser flows to recesses 9.16 igpm

Total flow to bearing (Gemst totaliser) = 14.79 igpm

TABLE 20.0A TABLE 20.0A

DECREASING MANIFOLD PRESSURES UNDER RATED APPLIED LOAD

IMPOSED CONDITIONS

TEST SHEET 158 RESULTS	A		B		C		D	
VERTICAL LOADING:								
APPLIED LOAD	4358	lb	4358	lb	4358	lb	4358	lb
+ PISTON LOAD	949	lb	911	lb	866	lb	822	lb
= TOTAL LOAD	5307	lb	5269	lb	5224	lb	5180	lb
WATER TEMPERATURE	28.9	C	28.1	C	27.5	C	27.6	C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00							

PRESSURES AND FLOW RATES

TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER	1.29	37.5	1.32	35.8	1.34	34.3	1.37	31.9
FORWARD RECESSES STBD INNER AND OUTER	1.47	37.4	1.51	25.7	1.54	34.0	1.57	31.6
AFTER RECESSES PORT OUTER AND INNER	1.37	35.6	1.41	34.2	1.44	32.3	1.48	29.6
AFTER RECESSES STBD INNER AND OUTER	1.12	40.9	1.15	36.2	1.22	31.0	1.33	24.3
Summed Flow, Av.Press.	5.25	37.8	5.39	35.5	5.54	32.9	5.75	29.4
FLOW BY GEMST	5.63		5.82		5.95		6.15	
MANIFOLD PRESSURE		89.6		89.5		89.3		88.4
PISTON PRESSURE sensor		148.0		143.0		137.5		129.0
gauge		150		144		137		130

BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER	1.36	142.0	1.05	138.8	0.78	134.3	0.59	125.9
PORT INNER	1.36		1.23		1.07		0.87	
CENTRE	1.10	143.0	0.78	138.7	0.59	134.0	0.48	125.3
STBD INNER	1.54		1.28		0.88		0.68	
STBD OUTER	3.73	134.0	3.25	132.0	2.88	128.5	2.44	122.0
Summed Flow, Av.Press.	9.09	139.7	7.59	136.5	6.20	132.3	3.06	124.4
FLOW BY GEMST	9.16		7.28		5.73		4.40	
MANIFOLD PRESSURE		153.0		147.0		142.0		133.0

TOTAL FLOW TO BEARING

	A	B	C	D
BY GEMST TOTALISER	14.79	13.10	11.68	10.55

FLOAT OF SHAFT IN BOTTOM HALF BEARING

	A	B	C	D
FORWARD DIAL GAUGE	.00198 in	.00168 in	.00138 in	.00082 in
AFTER DIAL GAUGE	.00212 in	.00178 in	.00140 in	.00076 in
Float at Centre	.00205 in	.00173 in	.00139 in	.00079 in

DECREASING MANIFOLD PRESSURES UNDER RATED APPLIED LOAD - IMPOSED CONDITIONS

TEST SHEET 158 RESULTS		E		F		G		H	
VERTICAL LOADING:									
APPLIED LOAD		4358	lb	4358	lb	4358	lb	4358	lb
+ PISTON LOAD		791	lb	740	lb	715	lb	696	lb
= TOTAL LOAD		5149	lb	5098	lb	5073	lb	5054	lb
WATER TEMPERATURE		27.5	C	27.9	C	28.0	C	27.6	C
OTHER CONDITIONS		Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	1.40	30.9	1.40	28.9	1.40	28.0	1.40	27.3
	STBD INNER AND OUTER	1.59	30.4	1.60	28.3	1.61	27.0	1.60	26.5
AFTER RECESSES	PORT OUTER AND INNER	1.49	28.6	1.50	26.4	1.51	26.0	1.50	25.8
	STBD INNER AND OUTER	1.33	22.1	1.33	19.6	1.33	19.0	1.33	18.9
Summed Flow, Av.Press.		5.81	28.0	5.83	25.8	5.85	25.0	5.83	24.6
FLOW BY GEMST		6.21		6.23		6.19		6.26	
MANIFOLD PRESSURE			88.0		87.0		86.6		86.8
PISTON PRESSURE	sensor		125.3		117.0		112.8		110.7
	gauge		125		117		113		110
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	0.57	122.0	0.57	114.8	0.57	110.3	0.57	107.0
	PORT INNER	0.80		0.76		0.75		0.74	
	CENTRE	0.47	121.0	0.47	113.5	0.47	108.9	0.47	106.0
	STBD INNER	0.65		0.64		0.64		0.64	
	STBD OUTER	2.29	119.0	2.11	111.0	2.04	107.3	1.99	104.0
Summed Flow, Av.Press.		4.78	120.7	5.55	113.1	4.47	108.8	4.41	105.7
FLOW BY GEMST		4.13		3.96		3.92		3.92	
MANIFOLD PRESSURE			128.0		120.5		116.0		113.0
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		10.34		10.19		10.11		10.18	
FLOAT OF SHAFT IN BOTTOM HALF BEARING									
FORWARD DIAL GAUGE		.00054	in	.00048	in	.00042	in	.00039	in
AFTER DIAL GAUGE		.00050	in	.00032	in	.00030	in	.00029	in
Float at Centre		.00052	in	.00040	in	.00036	in	.00034	in

TABLE 20.0A CONTINUATION TABLE 20.0A

DECREASING MANIFOLD PRESSURES UNDER RATED APPLIED LOAD
IMPOSED CONDITIONS

TEST SHEET 158 RESULTS		I		J		K		L	
VERTICAL LOADING:									
	APPLIED LOAD	4358	lb	4358	lb	4358	lb	4358	lb
	+ PISTON LOAD	645	lb	601	lb	569	lb	538	lb
	= TOTAL LOAD	5003	lb	4959	lb	4927	lb	4896	lb
WATER TEMPERATURE		27.3	C	28.0	C	27.6	C	27.9	C
OTHER CONDITIONS		Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	1.40	25.6	1.39	24.3	1.38	23.0	1.35	21.8
	STBD INNER AND OUTER	1.60	24.5	1.60	22.9	1.59	21.5	1.57	20.0
AFTER RECESSES	PORT OUTER AND INNER	1.50	24.9	1.50	24.3	1.48	23.7	1.45	22.9
	STBD INNER AND OUTER	1.33	18.0	1.31	17.3	1.29	16.6	1.26	15.9
Summed Flow, Av.Press.		5.83	23.2	5.80	22.2	5.74	21.2	5.63	20.1
FLOW BY GEMST		6.25		6.20		6.11		6.03	
MANIFOLD PRESSURE			84.7		83.0		80.0		78.7
PISTON PRESSURE	sensor		103.2		97.5		92.0		87.3
	gauge		102		95		90		85
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	0.57	99.4	0.57	93.7	0.57	88.3	0.57	83.2
	PORT INNER	0.71		0.69		0.67		0.65	
	CENTRE	0.46	98.9	0.46	93.0	0.46	87.6	0.46	82.5
	STBD INNER	0.64		0.64		0.64		0.64	
	STBD OUTER	1.88	98.2	1.80	91.8	1.73	87.1	1.67	81.7
Summed Flow, Av.Press.		4.26	98.8	4.16	92.8	4.07	87.7	3.99	82.5
FLOW BY GEMST		3.85		3.81		3.79		3.76	
MANIFOLD PRESSURE			105.0		99.9		93.8		89.0
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		10.10		10.01		9.90		9.79	
FLOAT OF SHAFT IN BOTTOM HALF BEARING									
FORWARD DIAL GAUGE		.00034 in		.00030 in		.00028 in		.00024 in	
AFTER DIAL GAUGE		.00028 in		.00024 in		.00024 in		.00022 in	
Float at Centre		.00031 in		.00027?in		.00026 in		.00023 in	

DECREASING MANIFOLD PRESSURES UNDER RATED APPLIED LOAD
IMPOSED CONDITIONS

TEST SHEET 158 RESULTS	M	N		
VERTICAL LOADING:				
APPLIED LOAD	4358 lb	4358 lb	lb	lb
+ PISTON LOAD	500 lb	468 lb	lb	lb
= TOTAL LOAD	4858 lb	4826 lb	lb	lb
WATER TEMPERATURE	27.8 C	27.6 C	C	C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00			

PRESSURES AND FLOW RATES

TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	1.32	20.4	1.28	19.0				
	STBD INNER AND OUTER	1.53	18.4	1.50	17.0				
AFTER RECESSES	PORT OUTER AND INNER	1.41	22.0	1.37	21.0				
	STBD INNER AND OUTER	1.22	15.1	1.17	14.0				
Summed Flow, Av.Press.		5.48	18.9	5.32	17.7				
FLOW BY GEMST		5.92		5.76					
MANIFOLD PRESSURE			74.3		70.0				
PISTON PRESSURE	sensor		81.3		76.0				
	gauge		79		74				

BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	0.57	77.6	0.57	71.9				
	PORT INNER	0.63		0.60					
	CENTRE	0.46	76.4	0.46	71.2				
	STBD INNER	0.64		0.64					
	STBD OUTER	1.60	75.5	1.55	70.4				
Summed Flow, Av.Press.		3.90	76.5	3.82	71.2				
FLOW BY GEMST		3.75		3.74					
MANIFOLD PRESSURE			83.0		77.0				

TOTAL FLOW TO BEARING

BY GEMST TOTALISER	9.67	9.50		

FLOAT OF SHAFT IN BOTTOM HALF BEARING

FORWARD DIAL GAUGE	.00022 in	.00022 in	in	in
AFTER DIAL GAUGE	.00022 in	.00020 in	in	in
Float at Centre	.00022 in	.00021 in	in	in

TABLE 20.0B

TABLE 20.0B

INCREASING MANIFOLD PRESSURES UNDER RATED APPLIED LOAD

IMPOSED CONDITIONS

TEST SHEET 158 RESULTS	A		B		C		D	
VERTICAL LOADING:								
APPLIED LOAD	4358	lb	4358	lb	4358	lb	4358	lb
+ PISTON LOAD	474	lb	493	lb	581	lb	645	lb
= TOTAL LOAD	4832	lb	4851	lb	4939	lb	5003	lb
WATER TEMPERATURE	27.9	C	27.7	C	27.3	C	28.0	C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER	1.28	19.2	1.30	21.4	1.39	23.3	1.42	25.5
FORWARD RECESSES STBD INNER AND OUTER	1.50	17.0	1.60	19.5	1.61	21.8	1.65	24.3
AFTER RECESSES PORT OUTER AND INNER	1.37	21.1	1.50	22.7	1.51	23.9	1.54	24.8
AFTER RECESSES STBD INNER AND OUTER	1.18	14.4	1.26	15.8	1.31	16.9	1.36	18.1
Summed Flow, Av.Press.	5.33	17.9	5.66	19.9	5.80	21.5	6.00	23.2
FLOW BY GEMST	5.73		6.00		6.20		6.34	
MANIFOLD PRESSURE		70.6		77.5		82.1		86.5
PISTON PRESSURE sensor		76.9		85.4		93.5		103.0
gauge		75		78		92		102
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER	0.57	71.6	0.57	81.2	0.57	89.7	0.57	99.8
PORT INNER	0.60		0.64		0.67		0.70	
CENTRE	0.46	71.25	0.46	80.6	0.46	89.0	0.46	98.7
STBD INNER	0.64		0.64		0.64		0.64	
STBD OUTER	1.55	71.5	1.63	79.8	1.71	88.0	1.83	98.0
Summed Flow, Av.Press.	3.82	71.5	3.94	80.5	4.05	89.0	4.20	98.8
FLOW BY GEMST	3.73		3.76		3.79		3.85	
MANIFOLD PRESSURE		78.5		86.8		95.6		105.8
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	9.46		9.76		9.99		10.19	
FLOAT OF SHAFT IN BOTTOM HALF BEARING								
FORWARD DIAL GAUGE	.00022 in		.00022 in		.00027 in		.00032 in	
AFTER DIAL GAUGE	.00020 in		.00021 in		.00021 in		.00022 in	
Float at Centre	.00021 in		.000215in		.00024 in		.00027 in	

TABLE 20.0B CONTINUATION TABLE 20.0B

INCREASING MANIFOLD PRESSURES UNDER RATED APPLIED LOAD

IMPOSED CONDITIONS

TEST SHEET 158 RESULTS	E		F		G		H	
VERTICAL LOADING:								
APPLIED LOAD	4358	lb	4358	lb	4358	lb	4358	lb
+ PISTON LOAD	695	lb	727	lb	771	lb	790	lb
= TOTAL LOAD	5053	lb	5085	lb	5129	lb	5148	lb
WATER TEMPERATURE	27.8	C	27.9	C	28.1	C	28.9	C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER	1.43	27.4	1.40	28.4	1.40	30.0	1.40	31.0
FORWARD RECESSES STBD INNER AND OUTER	1.66	26.6	1.70	27.8	1.70	30.0	1.70	30.0
AFTER RECESSES PORT OUTER AND INNER	1.56	25.6	1.60	26.1	1.60	27.0	1.60	28.0
AFTER RECESSES STBD INNER AND OUTER	1.38	19.0	1.40	19.6	1.40	21.0	1.40	22.0
Summed Flow, Av.Press.	6.03	24.6	6.10	25.5	6.10	27.0	6.10	27.7
FLOW BY GEMST	6.44		6.43		6.44		6.43	
MANIFOLD PRESSURE		88.9		90.8		92.0		91.3
PISTON PRESSURE sensor		111.4		115.6		122.1		125.2
gauge		110		115		122		125
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER	0.57	108.9	0.57	112.8	0.57	119.1	0.57	122.3
PORT INNER	0.72		0.74		0.75		0.76	
CENTRE	0.46	107.6	0.47	111.8	0.47	118.5	0.47	120.9
STBD INNER	0.64		0.64		0.64		0.64	
STBD OUTER	1.95	106.0	2.02	110.2	2.13	116.6	2.19	118.7
Summed Flow, Av.Press.	4.34	107.5	4.44	111.6	3.92	88.5	4.63	120.7
FLOW BY GEMST	3.90		3.93		3.99		4.01	
MANIFOLD PRESSURE		114.7		119.2		125.8		127.8
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	10.34		10.36		10.43		10.44	
FLOAT OF SHAFT IN BOTTOM HALF BEARING								
FORWARD DIAL GAUGE	.00034 in		.00034 in		.00037 in		.00038 in	
AFTER DIAL GAUGE	.00024 in		.00026 in		.00029 in		.00031 in	
Float at Centre	.00029 in		.00030 in		.00033 in		.000345in	

INCREASING MANIFOLD PRESSURES UNDER RATED APPLIED LOAD
- IMPOSED CONDITIONS

TEST SHEET 158 RESULTS	I		J		K		L	
VERTICAL LOADING:								
APPLIED LOAD	4358	lb	4358	lb	4358	lb	4358	lb
+ PISTON LOAD	822	lb	853	lb	885	lb	916	lb
= TOTAL LOAD	5180	lb	5211	lb	5243	lb	5274	lb
WATER TEMPERATURE	28.9	C	28.3	C	28.6	C	28.3	C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00							

PRESSURES AND FLOW RATES

TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER	1.50	32.0	1.45	33.0	1.42	34.5	1.40	35.9
FORWARD RECESSES STBD INNER AND OUTER	1.70	32.0	1.64	33.0	1.62	34.8	1.60	36.0
AFTER RECESSES PORT OUTER AND INNER	1.60	29.5	1.52	32.0	1.48	36.3	1.45	38.5
AFTER RECESSES STBD INNER AND OUTER	1.40	24.0	1.34	28.0	0.27	35.5	1.18	43.6
Summed Flow, Av.Press.	6.20	29.4	5.95	31.5	5.80	35.2	5.63	38.5
FLOW BY GEMST	6.40		6.32		6.17		5.98	
MANIFOLD PRESSURE		92.3		93.4		94.1		94.8
PISTON PRESSURE sensor		129.2		134.0		139.3		144.0
gauge		130		135		140		145

BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER	0.57	126.8	0.59	131.5	0.66	136.0	0.94	140.3
PORT INNER	0.80		0.86		1.00		1.16	
CENTRE	0.47	125.9	0.48	130.6	0.53	135.8	0.67	140.3
STBD INNER	0.64		0.64		0.76		1.14	
STBD OUTER	2.29	122.8	2.43	127.3	2.74	132.0	3.16	133.6
Summed Flow, Av.Press.	4.77	125.2	5.00	129.8	5.70	134.6	7.70	138.1
FLOW BY GEMST	4.15		4.36		5.15		6.67	
MANIFOLD PRESSURE		133.1		137.5		143.7		148.5

TOTAL FLOW TO BEARING

BY GEMST TOTALISER	10.55	10.68	11.32	12.65

FLOAT OF SHAFT IN BOTTOM HALF BEARING

FORWARD DIAL GAUGE	.00046 in	.00061 in	.00100 in	.00150 in
AFTER DIAL GAUGE	.00048 in	.00067 in	.00107 in	.00156 in
Float at Centre	.00047 in	.00064 in	.001035in	.00153 in

TABLE 20.0B CONTINUATION TABLE 20.0B

INCREASING MANIFOLD PRESSURES UNDER RATED APPLIED LOAD
IMPOSED CONDITIONS

TEST SHEET 158 RESULTS	M		N		O		P	
VERTICAL LOADING:								
APPLIED LOAD	4358	lb	4358	lb	4358	lb	4358	lb
+ PISTON LOAD	926	lb	935	lb	964	lb	986	lb
= TOTAL LOAD	5284	lb	5293	lb	5322	lb	5344	lb
WATER TEMPERATURE	28.5	C	28.3	C	28.3	C	29.2	C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER	1.41	36.2	1.40	36.9	1.39	37.8	1.38	38.7
FORWARD RECESSES STBD INNER AND OUTER	1.59	36.5	1.60	37.3	1.58	38.3	1.57	39.3
AFTER RECESSES PORT OUTER AND INNER	1.41	38.5	1.40	39.3	1.43	39.9	1.42	40.6
AFTER RECESSES STBD INNER AND OUTER	1.15	45.2	1.28	47.9	1.09	50.5	1.08	52.8
Summed Flow, Av.Press.	5.56	39.1	5.68	40.2	5.49	41.6	5.45	42.8
FLOW BY GEMST	5.98		5.97		5.89		5.88	
MANIFOLD PRESSURE		94.5		95.0		95.3		95.5
PISTON PRESSURE sensor		145.0?		148.1		151.0		154.0
gauge		146.5		148		152.5		156
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER	1.05	141.0	1.18	143.5	1.43	146.0	1.74	148.5
PORT INNER	1.20		1.27		1.37		1.46	
CENTRE	0.78	140.9	0.93	143.3	1.19	145.7	1.48	147.9
STBD INNER	1.31		1.48		1.82		2.14	
STBD OUTER	3.30	134.8	3.45	136.0	3.76	137.5	3.98	139.1
Summed Flow, Av.Press.	7.60	138.3	8.31	140.9	9.52	143.0	10.8	145.1
FLOW BY GEMST	7.34		8.00		9.34		10.61	
MANIFOLD PRESSURE		150.1		152.5		156.0		158.9
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	13.32		13.97		15.23		16.49	
FLOAT OF SHAFT IN BOTTOM HALF BEARING								
FORWARD DIAL GAUGE	.00157 in		.00170 in		.00198 in		.00230 in	
AFTER DIAL GAUGE	.00169 in		.00186 in		.00212 in		.00232 in	
Float at Centre	.00163 in		.00178 in		.00205 in		.00231 in	

TABLE 20.1A   TABLE 20.1A

DECREASING MANIFOLD PRESSURES UNDER 1000 LB APPLIED LOAD IMPOSED CONDITIONS								
TEST SHEET 167 RESULTS	A		B		C		D	
VERTICAL LOADING:								
APPLIED LOAD	1000	lb	1000	lb	1000	lb	1000	lb
+ PISTON LOAD	408	lb	417	lb	411	lb	395	lb
= TOTAL LOAD	1408	lb	1417	lb	1411	lb	1395	lb
WATER TEMPERATURE	25.4	C	26.1	C	26.3	C	26.7	C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER	1.13	18.5	1.11	17.9	1.10	17.6	1.09	16.9
STBD INNER AND OUTER	1.42	15.1	1.40	14.6	1.38	14.2	1.36	13.7
AFTER RECESSES PORT OUTER AND INNER	1.30	19.2	1.30	17.7	1.30	16.7	1.30	15.9
STBD INNER AND OUTER	1.25	25.6	1.25	23.6	1.25	21.7	1.25	19.0
Summed Flow, Av.Press.	5.10	78.4	5.06	18.5	5.03	17.55	5.00	16.4
FLOW BY GEMST	5.46		5.41		5.41		5.41	
MANIFOLD PRESSURE		65.2		63.7		62.4		60.6
PISTON PRESSURE sensor		70.6		68.9		67.6		65.8
gauge		67.5		66		65		62.5
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
PORT OUTER	1.05	64.7	0.99	63.2	0.92	62.0	0.82	60.2
FWD/AFT PORT INNER	0.87		0.88		0.88		0.85	
PAIRS OF CENTRE	0.82	63.2	0.74	62.5	0.68	61.5	0.62	59.8
RECESSES STBD INNER	0.98		0.98		0.98		0.89	
STBD OUTER	2.47	60.5	2.41	59.3	2.33	58.6	2.21	57.4
Summed Flow, Av.Press.	6.19	63.0	6.00	61.7	57.9	60.7	5.39	59.1
FLOW BY GEMST	6.04		5.77		5.47		5.10	
MANIFOLD PRESSURE		71.4		69.9		68.6		66.7
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	6.50		11.18		10.88		10.51	
FLOAT OF SHAFT IN BOTTOM HALF BEARING								
FORWARD DIAL GAUGE	.00214 in		.00197 in		.00183 in		.00162 in	
AFTER DIAL GAUGE	.00217 in		.00207 in		.00198 in		.00183 in	
Float at Centre	.002155in		.00202 in		.001905in		.001725in	

TABLE 20.1A CONTINUATION TABLE 20.1A

DECREASING MANIFOLD PRESSURES UNDER 1000 LB APPLIED LOAD
IMPOSED CONDITIONS

TEST SHEET 167 RESULTS	E		F		G		H	
VERTICAL LOADING:								
APPLIED LOAD	1000	lb	1000	lb	1000	lb	1000	lb
+ PISTON LOAD	390	lb	379	lb	373	lb	360	lb
= TOTAL LOAD	1390	lb	1379	lb	1373	lb	1360	lb
WATER TEMPERATURE	27.1	C	27.5	C	27.1	C	27.0	C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER	1.08	16.6	1.06	16.2	1.06	15.9	1.04	15.3
FORWARD RECESSES STBD INNER AND OUTER	1.35	13.3	1.32	12.9	1.32	12.6	1.30	12.0
AFTER RECESSES PORT OUTER AND INNER	1.30	15.5	1.28	15.0	1.27	14.7	1.25	14.1
AFTER RECESSES STBD INNER AND OUTER	1.24	17.6	1.22	15.7	1.21	14.5	1.20	12.2
Summed Flow, Av.Press.	4.97	17.8	4.88	14.9	4.86	14.4	4.79	13.4
FLOW BY GEMST	5.37		5.25		5.22		5.29	
MANIFOLD PRESSURE		59.5		57.9		57.1		55.1
PISTON PRESSURE sensor		64.6		63.3		62.5		60.5
gauge		61.5		60		59		57
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER	0.77	59.2	0.72	57.8	0.69	57.0	0.65	55.1
PORT INNER	0.84		0.82		0.80		0.78	
CENTRE	0.60	58.8	0.57	57.6	0.55	56.7	0.53	55.0
STBD INNER	0.84		0.78		0.76		0.73	
STBD OUTER	2.15	56.5	2.05	55.2	1.99	54.5	1.88	52.9
Summed Flow, Av.Press.	5.20	58.2	4.94	56.9	4.79	56.0	4.57	54.3
FLOW BY GEMST	4.92		4.65		4.51		4.26	
MANIFOLD PRESSURE		65.5		64.0		63.0		61.2
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	10.29		9.90		9.73		9.55	
FLOAT OF SHAFT IN BOTTOM HALF BEARING								
FORWARD DIAL GAUGE	.00150	in	.00137	in	.00127	in	.00106	in
AFTER DIAL GAUGE	.00173	in	.00159	in	.00150	in	.00132	in
Float at Centre	.001605	in	.00148	in	.001385	in	.00119	in

TABLE 20.1A CONTINUATION TABLE 20.1A

DECREASING MANIFOLD PRESSURES UNDER 1000 LB APPLIED LOAD
IMPOSED CONDITIONS

TEST SHEET 167 RESULTS	I		J		K		L	
VERTICAL LOADING:								
APPLIED LOAD	1000	lb	1000	lb	1000	lb	1000	lb
+ PISTON LOAD	357	lb	348	lb	335	lb	323	lb
= TOTAL LOAD	1357	lb	1348	lb	1335	lb	1323	lb
WATER TEMPERATURE	27.2	C	27.8	C	27.9	C	27.5	C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER	1.04	15.3	1.01	14.4	0.99	14.1	0.96	13.6
FORWARD RECESSES STBD INNER AND OUTER	1.30	11.8	1.26	11.1	1.25	10.6	1.22	10.1
AFTER RECESSES PORT OUTER AND INNER	1.25	13.8	1.21	13.1	1.20	12.7	1.18	12.1
AFTER RECESSES STBD INNER AND OUTER	1.19	11.7	1.16	9.2	1.15	8.0	1.14	6.7
Summed Flow, Av.Press.	4.78	13.2	4.64	15.9	4.59	11.4	4.50	10.6
FLOW BY GEMST	5.23		5.14		5.09		5.07	
MANIFOLD PRESSURE		54.8		53.8		53.8		53.8
PISTON PRESSURE sensor		60.2		57.6		56.3		54.4
gauge		56.5		55		53		51
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER	0.64	54.6	0.61	51.9	0.60	50.6	0.59	48.7
PORT INNER	0.77		0.73		0.70		0.67	
CENTRE	0.52	54.5	0.50	51.9	0.49	50.5	0.49	48.7
STBD INNER	0.73		0.70		0.69		0.67	
STBD OUTER	1.85	52.6	1.73	50.2	1.67	49.1	1.61	47.2
Summed Flow, Av.Press.	4.51	53.9	4.27	51.3	4.15	50.1	4.03	48.2
FLOW BY GEMST	4.22		3.96		3.92		3.85	
MANIFOLD PRESSURE		61.0		58.0		56.6		54.8
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	9.45		9.10		9.01		8.92	
FLOAT OF SHAFT IN BOTTOM HALF BEARING								
FORWARD DIAL GAUGE	.00099	in	.00077	in	.00010	in	.00046	in
AFTER DIAL GAUGE	.00128	in	.00103	in	.00082	in	.00078	in
Float at Centre	.001135	in	.00090	in	.00072	in	.00062	in

TABLE 20.1A CONTINUATION TABLE 20.1A

DECREASING MANIFOLD PRESSURES UNDER 1000 LB APPLIED LOAD
IMPOSED CONDITIONS

TEST SHEET 167 RESULTS	M	N	O	P
VERTICAL LOADING:				
APPLIED LOAD	1000 lb	1000 lb	1000 lb	1000 lb
+ PISTON LOAD	316 lb	310 lb	304 lb	297 lb
= TOTAL LOAD	1316 lb	1310 lb	1304 lb	1297 lb
WATER TEMPERATURE	27.9 C	28.5 C	28.0 C	27.9 C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00			

PRESSURES AND FLOW RATES

TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	0.96	13.6	0.95	13.2	0.94	12.9	0.91	12.2
	STBD INNER AND OUTER	1.22	10.1	1.19	9.6	1.18	9.4	1.13	8.7
AFTER RECESSES	PORT OUTER AND INNER	1.17	12.1	1.17	11.6	1.16	11.3	1.12	10.7
	STBD INNER AND OUTER	1.12	6.6	1.10	5.6	1.10	5.2	1.07	3.8
Summed Flow, Av.Press.		4.47	10.6	4.41	10.0	4.38	9.7	4.23	8.9
FLOW BY GEMST		5.05		5.03		5.01		4.88	
MANIFOLD PRESSURE			53.8		53.9		53.9		53.9
PISTON PRESSURE	sensor		54.4		53.2		52.5		49.8
	gauge		50		49		48		47

BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	0.59	48.7	0.58	47.3	0.58	46.8	0.58	44.0
	PORT INNER	0.67		0.64		0.63		0.59	
	CENTRE	0.49	48.6	0.48	47.3	0.48	46.6	0.48	43.9
	STBD INNER	0.68		0.67		0.66		0.66	
	STBD OUTER	1.60	47.6	1.56	46.0	1.54	45.5	1.49	42.8
Summed Flow, Av.Press.		4.03	48.3	3.93	46.9	3.89	46.3	3.80	43.6
FLOW BY GEMST		3.85		3.83		3.82		3.77	
MANIFOLD PRESSURE			54.8		53.7		52.9		50.0

TOTAL FLOW TO BEARING

BY GEMST TOTALISER	8.90	8.86	8.83	8.65

FLOAT OF SHAFT IN BOTTOM HALF BEARING

FORWARD DIAL GAUGE	.00040 in	.00037 in	.00021 in	.00013 in
AFTER DIAL GAUGE	.00073 in	.00068 in	.00062 in	.00062 in
Float at Centre	.000565in	.000525in	.000415in	.000385in

TABLE 20.1A CONTINUATION TABLE 20.1A

DECREASING MANIFOLD PRESSURES UNDER 1000 LB APPLIED LOAD
- IMPOSED CONDITIONS

TEST SHEET 167 RESULTS		Q							
VERTICAL LOADING:									
	APPLIED LOAD	1000	lb		lb		lb		lb
	+ PISTON LOAD	89	lb		lb		lb		lb
	= TOTAL LOAD	1089	lb		lb		lb		lb
WATER TEMPERATURE		28.5	C		C		C		C
OTHER CONDITIONS		Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	0.43	5.1						
	STBD INNER AND OUTER	0.50	0.7						
AFTER RECESSES	PORT OUTER AND INNER	0.62	4.4						
	STBD INNER AND OUTER	0.59	2.1						
Summed Flow, Av.Press.		2.14	3.1						
FLOW BY GEMST		3.54							
MANIFOLD PRESSURE			12.6						
PISTON PRESSURE	sensor		20.5						
	gauge		14						
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	0.58	14.0						
	PORT INNER	0.38							
	CENTRE	0.47	13.8						
	STBD INNER	0.65							
	STBD OUTER	0.91	13.2						
Summed Flow, Av.Press.		2.99	13.7						
FLOW BY GEMST		3.54							
MANIFOLD PRESSURE			19.8						
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		7.20							
FLOAT OF SHAFT IN BOTTOM HALF BEARING									
FORWARD DIAL GAUGE		-.00008	in		in		in		in
AFTER DIAL GAUGE		-.00002	in		in		in		in
Float at Centre		-.00005	in		in		in		in

TABLE 20.1B TABLE 20.1B

INCREASING MANIFOLD PRESSURES UNDER 1000 LB APPLIED LOAD
- IMPOSED CONDITIONS

TEST SHEET 167 RESULTS	A		B		C		D	
VERTICAL LOADING:								
APPLIED LOAD	1000	lb	1000	lb	1000	lb	1000	lb
+ PISTON LOAD	89	lb	259	lb	304	lb	329	lb
= TOTAL LOAD	1089	lb	1259	lb	1304	lb	1329	lb
WATER TEMPERATURE	27.8	C	27.9	C	28.1	C	28.9	C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER	0.43	5.1	0.84	11.2	0.93	12.9	0.98	13.7
FORWARD RECESSES STBD INNER AND OUTER	0.50	0.6	1.04	7.3	1.18	9.2	1.25	10.3
AFTER RECESSES PORT OUTER AND INNER	0.62	4.4	1.00	9.4	1.11	11.3	1.16	12.7
AFTER RECESSES STBD INNER AND OUTER	0.59	2.1	0.98	2.2	1.09	3.6	1.14	4.8
Summed Flow, Av.Press.	2.14	3.1	3.86	7.5	4.31	9.2	4.53	10.4
FLOW BY GEMST	3.53		4.70		5.00		5.12	
MANIFOLD PRESSURE		12.6		38.9		46.3		49.8
PISTON PRESSURE sensor		20.5		45.1		52.1		55.4
gauge		14		41		48		52
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER	0.58	14.0	0.59	39.1	0.59	46.4	0.59	49.9
PORT INNER	0.38		0.43		0.60		0.63	
CENTRE	0.47	13.8	0.47	38.9	0.48	46.2	0.48	49.4
STBD INNER	0.65		0.65		0.65		0.65	
STBD OUTER	0.91	13.2	1.40	38.4	1.49	45.3	1.55	48.9
Summed Flow, Av.Press.	2.99	13.7	3.54	38.5	3.81	46.0	3.90	49.4
FLOW BY GEMST	3.66		3.75		3.77		3.80	
MANIFOLD PRESSURE		19.7		45.2		52.5		55.7
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	7.19		8.40		8.77		8.92	
FLOAT OF SHAFT IN BOTTOM HALF BEARING								
FORWARD DIAL GAUGE	-.00008 in		.00002 in		.00008 in		.00008 in	
AFTER DIAL GAUGE	-.00002 in		.00004 in		.00020 in		.00039 in	
Float at Centre	-.00005 in		.00003 in		.00014 in		.000235in	

TABLE 20.1B CONTINUATION TABLE 20.1B

INCREASING MANIFOLD PRESSURES UNDER 1000 LB APPLIED LOAD

IMPOSED CONDITIONS

TEST SHEET 167 RESULTS	E	F	G	H
VERTICAL LOADING:				
APPLIED LOAD	1000 lb	1000 lb	1000 lb	1000 lb
+ PISTON LOAD	348 lb	364 lb	379 lb	385 lb
= TOTAL LOAD	1348 lb	1364 lb	1379 lb	1385 lb
WATER TEMPERATURE	28.4 C	28.8 C	28.9 C	29.1 C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00			

PRESSURES AND FLOW RATES

TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	1.02	14.5	1.05	15.0	1.07	15.7	1.08	16.0
	STBD INNER AND OUTER	1.29	11.2	1.33	11.8	1.36	12.6	1.37	12.8
AFTER RECESSES	PORT OUTER AND INNER	1.20	13.8	1.22	14.7	1.25	16.0	1.24	16.8
	STBD INNER AND OUTER	1.18	6.0	1.20	7.0	1.22	8.8	1.21	10.2
Summed Flow, Av.Press.		4.69	11.4	4.80	12.1	4.90	13.3	4.90	13.9
FLOW BY GEMST		5.21		5.30		5.42		5.42	
MANIFOLD PRESSURE			53.7		55.4		58.3		58.8
PISTON PRESSURE sensor			58.5		60.7		63.4		64.0
	gauge		55		57.5		60		61

BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	0.59	53.0	0.59	55.4	0.61	58.0	0.63	58.5
	PORT INNER	0.67		0.69		0.74		0.77	
	CENTRE	0.49	52.8	0.49	55.0	0.50	57.7	0.51	58.2
	STBD INNER	0.67		0.68		0.69		0.71	
	STBD OUTER	1.61	51.5	1.67	53.8	1.76	56.2	1.82	56.7
Summed Flow, Av.Press.		4.03	52.4	4.12	54.7	4.30	57.3	4.44	57.8
FLOW BY GEMST		3.85		3.90		3.99		4.15	
MANIFOLD PRESSURE			59.1		61.4		64.4		65.1

TOTAL FLOW TO BEARING

	E	F	G	H
BY GEMST TOTALISER	9.06	9.20	9.41	9.57

FLOAT OF SHAFT IN BOTTOM HALF BEARING

	E	F	G	H
FORWARD DIAL GAUGE	.00017 in	.00027 in	.00047 in	.00061 in
AFTER DIAL GAUGE	.00053 in	.00067 in	.00085 in	.00100 in
Float at Centre	.00030 in	.00047?in	.00066 in	.000805in

INCREASING MANIFOLD PRESSURES UNDER 1000 LB APPLIED LOAD

IMPOSED CONDITIONS

TEST SHEET 167 RESULTS	I	J	K	L
VERTICAL LOADING:				
APPLIED LOAD	1000 lb	1000 lb	1000 lb	1000 lb
+ PISTON LOAD	389 lb	392 lb	405 lb	417 lb
= TOTAL LOAD	1389 lb	1392 lb	1405 lb	1417 lb
WATER TEMPERATURE	28.8 C	28.6 C	28.7 C	28.8 C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00			

PRESSURES AND FLOW RATES

TOP HALF BEARING		I igpm	I psig	J igpm	J psig	K igpm	K psig	L igpm	L psig
FORWARD RECESSES	PORT OUTER AND INNER	1.08	16.0	1.10	16.6	1.11	17.0	1.12	17.4
	STBD INNER AND OUTER	1.37	12.9	1.39	13.5	1.39	13.9	1.39	14.3
AFTER RECESSES	PORT OUTER AND INNER	1.24	17.3	1.25	18.6	1.26	18.9	1.28	19.2
	STBD INNER AND OUTER	1.21	11.0	1.22	14.3	1.24	16.7	1.26	19.3
Summed Flow, Av.Press.		4.90	14.3	4.96	15.8	5.00	16.6	5.05	17.6
FLOW BY GEMST		5.40		5.41		5.49		5.51	
MANIFOLD PRESSURE			58.9		60.5		61.9		63.0
PISTON PRESSURE	sensor		64.3		65.8		67.1		68.5
	gauge		61.5		62		64		66

BOTTOM HALF BEARING		I igpm	I psig	J igpm	J psig	K igpm	K psig	L igpm	L psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	0.63	58.8	0.69	60.3	0.74	61.3	0.84	62.7
	PORT INNER	0.79		0.84		0.87		0.90	
	CENTRE	0.52	58.5	0.55	60.1	0.58	61.1	0.63	62.3
	STBD INNER	0.72		0.76		0.80		0.91	
	STBD OUTER	1.86	56.7	2.00	58.2	2.12	59.0	2.25	59.8
Summed Flow, Av.Press.		4.52	58.0	4.84	59.5	5.11	60.5	5.53	61.6
FLOW BY GEMST		4.16		4.54		4.84		5.25	
MANIFOLD PRESSURE			65.4		66.7		68.2		69.6

TOTAL FLOW TO BEARING

	I	J	K	L
BY GEMST TOTALISER	9.56	9.95	10.33	10.76

FLOAT OF SHAFT IN BOTTOM HALF BEARING

	I	J	K	L
FORWARD DIAL GAUGE	.00068 in	.00100 in	.00117 in	.00138 in
AFTER DIAL GAUGE	.00110 in	.00138 in	.00157 in	.00177 in
Float at Centre	.00089 in	.00119 in	.00137 in	.001575in

TABLE 20.1B CONTINUATION TABLE 20.1B

INCREASING MANIFOLD PRESSURES UNDER 1000 LB APPLIED LOAD

IMPOSED CONDITIONS

TEST SHEET 167 RESULTS		M		N					
VERTICAL LOADING:									
	APPLIED LOAD	1000	lb	1000	lb		lb		lb
	+ PISTON LOAD	430	lb	449	lb		lb		lb
	= TOTAL LOAD	1430	lb	1449	lb		lb		lb
WATER TEMPERATURE		29.2	C	29.5	C		C		C
OTHER CONDITIONS		Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	1.15	18.2	1.17	19.0				
	STBD INNER AND OUTER	1.44	15.1	1.47	16.0				
AFTER RECESSES	PORT OUTER AND INNER	1.31	19.8	1.35	20.6				
	STBD INNER AND OUTER	1.28	23.1	1.31	26.5				
Summed Flow, Av.Press.		5.18	19.1	5.30	20.5				
FLOW BY GEMST		5.54		5.61					
MANIFOLD PRESSURE			65.5		68.4				
PISTON PRESSURE	sensor		70.9		73.9				
	gauge		68		71				
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	1.00	65.0	1.14	67.9				
	PORT INNER	0.95		0.99					
	CENTRE	0.72	64.3	0.89	66.8				
	STBD INNER	1.11		1.32					
	STBD OUTER	2.44	61.6	2.63	63.4				
Summed Flow, Av.Press.		6.22	63.6	6.97	66.0				
FLOW BY GEMST		5.84		6.48					
MANIFOLD PRESSURE			71.9		75.0				
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		11.38		12.09					
FLOAT OF SHAFT IN BOTTOM HALF BEARING									
FORWARD DIAL GAUGE		.00166	in	.00190	in		in		in
AFTER DIAL GAUGE		.00198	in	.00220	in		in		in
Float at Centre		.00182	in	.00205	in		in		in

TABLE 20.2A

TABLE 20.2A

DECREASING MANIFOLD PRESSURES UNDER 2000 LB APPLIED LOAD

IMPOSED CONDITIONS

TEST SHEET 166 RESULTS	A		B		C		D	
VERTICAL LOADING:								
APPLIED LOAD	2000	lb	2000	lb	2000	lb	2000	lb
+ PISTON LOAD	620	lb	613	lb	601	lb	594	lb
= TOTAL LOAD	2620	lb	2613	lb	2601	lb	2594	lb
WATER TEMPERATURE	26.8	C	27.2	C	27.4	C	27.0	C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER	1.29	25.9	1.30	25.5	1.30	25.0	1.29	24.6
FORWARD RECESSES STBD INNER AND OUTER	1.60	23.9	1.60	23.7	1.60	23.2	1.59	22.7
AFTER RECESSES PORT OUTER AND INNER	1.51	25.4	1.51	24.8	1.51	24.3	1.51	23.7
AFTER RECESSES STBD INNER AND OUTER	1.46	36.3	1.47	34.5	1.47	32.9	1.47	30.3
Summed Flow, Av.Press.	5.86	27.6	5.88	27.1	5.88	26.4	5.86	25.3
FLOW BY GEMST	5.99		6.01		6.01		6.09	
MANIFOLD PRESSURE		84.4		83.9		83.4		83.0
PISTON PRESSURE sensor		100.2		98.9		97.9		96.2
gauge		98		97		95		94
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER	1.15	94.9	1.08	93.8	1.03	93.0	0.95	91.0
PORT INNER	1.01		0.99		0.98		0.96	
CENTRE	0.97	93.9	0.87	92.8	0.79	91.6	0.70	90.2
STBD INNER	1.48		1.37		1.28		1.15	
STBD OUTER	3.04	88.3	2.95	87.8	2.88	87.4	2.76	86.5
Summed Flow, Av.Press.	7.65	92.4	7.26	91.5	6.96	90.7	6.52	89.2
FLOW BY GEMST	7.34		6.89		6.57		6.21	
MANIFOLD PRESSURE		102.9		101.1		100.7		98.2
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	13.33		12.90		12.58		12.30	
FLOAT OF SHAFT IN BOTTOM HALF BEARING								
FORWARD DIAL GAUGE	.00194	in	.00182	in	.00172	in	.00158	in
AFTER DIAL GAUGE	.00204	in	.00194	in	.00185	in	.00175	in
Float at Centre	.00199	in	.00188	in	.001785	in	.001665	in

TABLE 20.2A CONTINUATION TABLE 20.2A

DESCENDING MANIFOLD PRESSURES UNDER 2000 LB APPLIED LOAD

IMPOSED CONDITIONS

TEST SHEET 166 RESULTS		E		F		G		H	
VERTICAL LOADING:									
	APPLIED LOAD	2000	lb	2000	lb	2000	lb	2000	lb
	+ PISTON LOAD	582	lb	569	lb	566	lb	550	lb
	= TOTAL LOAD	2582	lb	2569	lb	2566	lb	2550	lb
WATER TEMPERATURE		27.7	C	27.7	C	27.7	C	27.3	C
OTHER CONDITIONS		Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	1.29	24.0	1.28	23.6	1.28	23.2	1.27	22.5
	STBD INNER AND OUTER	1.59	22.3	1.59	21.8	1.58	21.2	1.58	20.7
AFTER RECESSES	PORT OUTER AND INNER	1.51	23.2	1.51	22.7	1.51	22.2	1.50	21.5
	STBD INNER AND OUTER	1.47	28.3	1.47	26.2	1.47	24.6	1.46	21.8
Summed Flow, Av.Press.		5.86	24.5	5.85	23.6	5.84	22.8	5.81	21.6
FLOW BY GEMST		6.01		6.07		6.06		6.02	
MANIFOLD PRESSURE			82.3		81.5		80.9		79.8
PISTON PRESSURE	sensor		94.6		92.9		91.4		89.3
	gauge		92		90		89.5		87
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	0.87	89.9	0.80	88.0	0.74	86.6	0.67	84.6
	PORT INNER	0.94		0.92		0.90		0.86	
	CENTRE	0.65	88.8	0.61	87.3	0.58	86.3	0.54	84.0
	STBD INNER	1.04		0.91		0.85		0.76	
	STBD OUTER	2.66	85.0	2.56	84.0	2.48	83.2	2.35	80.9
Summed Flow, Av.Press.		6.16	87.9	5.80	86.4	5.55	85.4	5.18	83.2
FLOW BY GEMST		5.76		5.48		5.22		4.82	
MANIFOLD PRESSURE			96.7		95.3		93.6		91.5
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		11.77		11.55		11.28		10.84	
FLOAT OF SHAFT IN BOTTOM HALF BEARING									
FORWARD DIAL GAUGE		.00148	in	.00133	in	.00123	in	.00104	in
AFTER DIAL GAUGE		.00163	in	.00152	in	.00143	in	.00127	in
Float at Centre		.001555	in	.001425	in	.00133	in	.001155	in

TABLE 20.2A CONTINUATION TABLE 20.2A

DECREASING MANIFOLD PRESSURES UNDER 2000 LB APPLIED LOAD
- IMPOSED CONDITIONS

TEST SHEET 166 RESULTS		I		J		K		L	
VERTICAL LOADING:									
	APPLIED LOAD	2000	lb	2000	lb	2000	lb	2000	lb
	+ PISTON LOAD	538	lb	531	lb	519	lb	512	lb
	= TOTAL LOAD	2538	lb	2531	lb	2519	lb	2512	lb
WATER TEMPERATURE		27.4	C	27.2	C	27.8	C	27.8	C
OTHER CONDITIONS		Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	1.26	22.0	1.26	21.6	1.25	21.2	1.24	20.9
	STBD INNER AND OUTER	1.57	20.0	1.56	19.8	1.55	19.3	1.54	18.9
AFTER RECESSES	PORT OUTER AND INNER	1.50	21.0	1.50	20.5	1.49	20.0	1.48	19.7
	STBD INNER AND OUTER	1.46	20.0	1.45	18.5	1.44	17.0	1.44	16.0
Summed Flow, Av.Press.		5.79	22.0	5.77	20.1	5.73	19.4	5.70	18.9
FLOW BY GEMST		6.00		6.05		6.01		5.99	
MANIFOLD PRESSURE			78.7		77.5		76.9		76.3
PISTON PRESSURE	sensor		87.5		86.0		84.4		83.4
	gauge		85		84		82		81
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	0.64	83.0	0.62	81.3	0.60	80.0	0.60	78.9
	PORT INNER	0.84		0.82		0.79		0.78	
	CENTRE	0.52	82.7	0.51	80.9	0.50	79.5	0.49	78.7
	STBD INNER	0.73		0.72		0.70		0.69	
	STBD OUTER	2.26	79.9	2.19	79.0	2.10	77.5	2.05	76.7
Summed Flow, Av.Press.		4.99	81.9	4.86	80.4	4.69	79.0	4.61	78.1
FLOW BY GEMST		4.61		4.46		4.28		4.18	
MANIFOLD PRESSURE			89.6		87.9		86.4		85.3
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		10.61		10.51		10.29		10.17	
FLOAT OF SHAFT IN BOTTOM HALF BEARING									
FORWARD DIAL GAUGE		.00091	in	.00080	in	.00070	in	.00060	in
AFTER DIAL GAUGE		.00112	in	.00101	in	.00090	in	.00080	in
Float at Centre		.001015	in	.000905	in	.00080	in	.00070	in

DECREASING MANIFOLD PRESSURES UNDER 2000 LB APPLIED LOAD
IMPOSED CONDITIONS

TEST SHEET 166 RESULTS	M		N		O		P	
VERTICAL LOADING:								
APPLIED LOAD	2000	lb	2000	lb	2000	lb	2000	lb
+ PISTON LOAD	500	lb	487	lb	462	lb	411	lb
= TOTAL LOAD	2500	lb	2487	lb	2462	lb	2411	lb
WATER TEMPERATURE	27.9	C	27.2	C	27.2	C	27.8	C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00							

PRESSURES AND FLOW RATES

TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER	1.23	20.5	1.22	19.8	1.19	18.6	1.13	16.9
FORWARD RECESSES STBD INNER AND OUTER	1.53	18.5	1.52	17.8	1.49	16.6	1.41	14.6
AFTER RECESSES PORT OUTER AND INNER	1.48	19.2	1.46	18.5	1.43	17.2	1.36	15.3
AFTER RECESSES STBD INNER AND OUTER	1.43	14.6	1.42	12.9	1.39	10.4	1.31	8.5
Summed Flow, Av.Press.	5.67	18.2	5.62	17.3	5.50	15.7	5.21	13.8
FLOW BY GEMST	5.95		5.89		5.81		5.53	
MANIFOLD PRESSURE		74.9		73.2		70.0		62.8
PISTON PRESSURE sensor		81.9		79.6		75.6		68.0
gauge		79		77		73		65

BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
PORT OUTER	0.59	77.5	0.57	75.2	0.57	70.9	0.57	63.1
FWD/AFT PORT INNER	0.75		0.72		0.67		0.63	
PAIRS OF CENTRE	0.49	76.8	0.48	74.9	0.47	70.3	0.47	68.2
RECESSES STBD INNER	0.67		0.66		0.64		0.64	
STBD OUTER	1.98	75.4	1.88	73.6	1.76	69.7	1.63	62.3
Summed Flow, Av.Press.	4.48	76.6	4.31	74.6	4.11	70.3	3.94	62.7
FLOW BY GEMST	4.03		3.93		3.84		3.78	
MANIFOLD PRESSURE		84.0		81.3		77.4		69.4

TOTAL FLOW TO BEARING

	M	N	O	P
BY GEMST TOTALISER	9.98	9.82	9.65	9.31

FLOAT OF SHAFT IN BOTTOM HALF BEARING

	M	N	O	P
FORWARD DIAL GAUGE	.00048 in	.00031 in	.00022 in	.00018 in
AFTER DIAL GAUGE	.00070 in	.00052 in	.00022 in	.00010 in
Float at Centre	.00059 in	.000415in	.00022 in	.00014 in

TABLE 20.2B

TABLE 20.2B

INCREASING MANIFOLD PRESSURES UNDER 2000 LB APPLIED LOAD
IMPOSED CONDITIONS

TEST SHEET 166 RESULTS	A		B		C		D	
VERTICAL LOADING:								
APPLIED LOAD	2000	lb	2000	lb	2000	lb	2000	lb
+ PISTON LOAD	424	lb	474	lb	487	lb	512	lb
= TOTAL LOAD	2424	lb	2474	lb	2487	lb	2512	lb
WATER TEMPERATURE	25.8	C	26.0	C	26.6	C	26.7	C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER	1.12	17.5	1.19	19.4	1.20	20.1	1.23	20.9
STBD INNER AND OUTER	1.39	14.7	1.49	17.1	1.51	18.8	1.54	18.8
AFTER RECESSES PORT OUTER AND INNER	1.34	16.5	1.42	18.0	1.45	19.8	1.48	19.8
STBD INNER AND OUTER	1.31	10.8	1.38	12.2	1.13	14.4	1.44	14.4
Summed Flow, Av.Press.	5.16	14.9	5.48	16.7	5.29	18.3	5.69	18.5
FLOW BY GEMST	5.55		5.82		5.91		6.01	
MANIFOLD PRESSURE		63.8		71.4		76.0		76.0
PISTON PRESSURE sensor		69.0		77.2		82.9		83.0
gauge		67		75		77		81
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER	0.57	64.6	0.57	73.2	0.57	80.0	0.57	78.9
PORT INNER	0.56		0.62		0.64		0.68	
CENTRE	0.47	64.6	0.47	72.9	0.47	78.7	0.47	78.7
STBD INNER	0.63		0.64		0.64		0.65	
STBD OUTER	1.53	63.1	1.64	71.4	1.70	76.8	1.79	76.8
Summed Flow, Av.Press.	3.76	64.1	3.94	72.5	4.02	78.5	4.16	78.1
FLOW BY GEMST	3.73		3.79		3.80		3.89	
MANIFOLD PRESSURE		70.2		78.8		84.6		84.6
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	9.28		9.61		9.71		9.90	
FLOAT OF SHAFT IN BOTTOM HALF BEARING								
FORWARD DIAL GAUGE	.00020 in		.00032 in		.00043 in		.00058 in	
AFTER DIAL GAUGE	.00000 in		.00002 in		.00003 in		.00014 in	
Float at Centre	.00010 in		.00017 in		.00023 in		.00036 in	

TABLE 20.2B CONTINUATION TABLE 20.2B

INCREASING MANIFOLD PRESSURES UNDER 2000 LB APPLIED LOAD
IMPOSED CONDITIONS

TEST SHEET 166 RESULTS		E		F		G		H	
VERTICAL LOADING:									
	APPLIED LOAD	2000	lb	2000	lb	2000	lb	2000	lb
	+ PISTON LOAD	538	lb	531	lb	557	lb	563	lb
	= TOTAL LOAD	2538	lb	2531	lb	2557	lb	2563	lb
WATER TEMPERATURE		27.1	C	27.1	C	27.1	C	26.9	C
OTHER CONDITIONS		Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	1.25	21.8	1.26	22.4	1.27	22.7	1.28	23.0
	STBD INNER AND OUTER	1.57	19.9	1.58	20.6	1.59	20.9	1.59	21.3
AFTER RECESSES	PORT OUTER AND INNER	1.49	21.3	1.50	22.6	1.50	23.1	1.50	24.4
	STBD INNER AND OUTER	1.46	16.7	1.47	18.9	1.47	20.0	1.46	22.6
Summed Flow, Av.Press.		5.77	19.9	5.81	21.1	5.83	21.7	5.83	22.8
FLOW BY GEMST		6.03		6.10		6.09		6.08	
MANIFOLD PRESSURE			78.4		80.0		80.6		81.3
PISTON PRESSURE	sensor		86.7		89.0		90.0		91.2
	gauge		85		87		88		89
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	0.58	82.8	0.60	85.5	0.60	86.1	0.62	87.1
	PORT INNER	0.72		0.76		0.77		0.81	
	CENTRE	0.48	82.6	0.49	85.3	0.49	85.9	0.51	86.9
	STBD INNER	0.66		0.68		0.68		0.71	
	STBD OUTER	1.91	80.3	2.01	82.7	2.06	83.4	2.15	84.3
Summed Flow, Av.Press.		4.35	81.8	4.54	84.5	4.60	85.1	4.80	86.1
FLOW BY GEMST		3.95		4.09		4.21		4.39	
MANIFOLD PRESSURE			88.7		91.3		92.1		93.1
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		9.98		10.19		10.30		10.47	
FLOAT OF SHAFT IN BOTTOM HALF BEARING									
FORWARD DIAL GAUGE		.00071	in	.00087	in	.00090	in	.00104	in
AFTER DIAL GAUGE		.00031	in	.00043	in	.00050	in	.00068	in
Float at Centre		.00054	in	.00065	in	.00070	in	.00086	in

INCREASING MANIFOLD PRESSURES UNDER 2000 LB APPLIED LOAD
- IMPOSED CONDITIONS

TEST SHEET 166 RESULTS		I		J		K		L	
VERTICAL LOADING:									
	APPLIED LOAD	2000	lb	2000	lb	2000	lb	2000	lb
	+ PISTON LOAD	569	lb	575	lb	582	lb	588	lb
	= TOTAL LOAD	2569	lb	2575	lb	2582	lb	2588	lb
WATER TEMPERATURE		26.7	C	27.5	C	27.0	C	27.0	C
OTHER CONDITIONS		Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	1.28	23.2	1.29	23.5	1.29	23.8	1.29	24.0
	STBD INNER AND OUTER	1.59	21.5	1.60	21.7	1.60	22.0	1.61	22.3
AFTER RECESSES	PORT OUTER AND INNER	1.49	25.4	1.48	26.1	1.49	26.6	1.49	26.9
	STBD INNER AND OUTER	1.45	24.6	1.45	26.3	1.46	28.6	1.45	30.2
Summed Flow, Av.Press.		5.81	23.7	5.82	24.4	5.84	25.3	5.84	25.9
FLOW BY GEMST		6.12		6.10		6.09		6.11	
MANIFOLD PRESSURE			81.9		82.5		82.9		83.3
PISTON PRESSURE	sensor		91.8		92.5		93.7		94.3
	gauge		90		91		92		93
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	0.65	87.9	0.67	88.5	0.72	98.2	0.77	90.0
	PORT INNER	0.83		0.85		0.88		0.90	
	CENTRE	0.52	87.7	0.53	88.5	0.56	89.0	0.59	89.8
	STBD INNER	0.73		0.75		0.79		0.86	
	STBD OUTER	2.23	85.0	2.30	85.0	2.39	85.8	2.47	86.1
Summed Flow, Av.Press.		4.96	86.9	5.10	87.1	5.34	89.0	5.59	88.6
FLOW BY GEMST		4.63		4.75		5.04		5.30	
MANIFOLD PRESSURE			94.1		95.0		95.8		96.5
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		10.75		10.85		11.13		11.41	
FLOAT OF SHAFT IN BOTTOM HALF BEARING									
FORWARD DIAL GAUGE		.00117	in	.00126	in	.00139	in	.00148	in
AFTER DIAL GAUGE		.00081	in	.00092	in	.00107	in	.00118	in
Float at Centre		.00099	in	.00109	in	.00123	in	.00133	in

INCREASING MANIFOLD PRESSURES UNDER 2000 LB APPLIED LOAD

IMPOSED CONDITIONS

TEST SHEET 166 RESULTS		M		N		O		P	
VERTICAL LOADING:									
	APPLIED LOAD	2000	lb	2000	lb	2000	lb	2000	lb
	+ PISTON LOAD	591	lb	601	lb	607	lb	613	lb
	= TOTAL LOAD	2591	lb	2601	lb	2607	lb	2613	lb
WATER TEMPERATURE		27.0	C	27.1	C	27.7	C	27.1	C
OTHER CONDITIONS		Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	1.30	24.4	1.30	24.7	1.31	25.0	1.31	25.3
	STBD INNER AND OUTER	1.61	22.6	1.62	23.0	1.63	23.3	1.64	23.5
AFTER RECESSES	PORT OUTER AND INNER	1.50	27.2	1.50	27.4	1.50	27.5	1.51	27.7
	STBD INNER AND OUTER	1.46	30.0	1.47	34.1	1.46	25.6	1.47	36.7
Summed Flow, Av.Press.		5.87	26.1	5.89	27.2	5.90	25.4	5.93	28.3
FLOW BY GEMST		6.05		6.09		6.10		6.10	
MANIFOLD PRESSURE			83.9		84.4		85.0		85.5
PISTON PRESSURE	sensor		95.5		96.9		97.7		98.7
	gauge		93.5		95		96		97
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	0.84	91.0	0.94	92.4	1.01	93.3	1.07	93.9
	PORT INNER	0.92		0.94		0.97		0.99	
	CENTRE	0.62	91.0	0.68	91.7	0.75	92.6	0.83	93.3
	STBD INNER	0.95		1.10		1.22		1.30	
	STBD OUTER	2.56	86.9	2.66	87.5	2.77	87.9	2.83	88.7
Summed Flow, Av.Press.		5.89	89.6	6.32	90.5	6.72	91.3	7.02	92.0
FLOW BY GEMST		5.50		5.97		6.39		6.68	
MANIFOLD PRESSURE			97.4		98.8		99.8		101.3
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		11.55		12.06		12.49		12.78	
FLOAT OF SHAFT IN BOTTOM HALF BEARING									
FORWARD DIAL GAUGE		.00160 in		.00173 in		.00184 in		.00191 in	
AFTER DIAL GAUGE		.00128 in		.00143 in		.00157 in		.00167 in	
Float at Centre		.00144 in		.00158 in		.00175 in		.00179 in	

TABLE 20.2B CONTINUATION TABLE 20.2B

INCREASING MANIFOLD PRESSURES UNDER 2000 LB APPLIED LOAD

IMPOSED CONDITIONS

TEST SHEET 166 RESULTS	Q		R		S		T	
VERTICAL LOADING:								
APPLIED LOAD	2000	lb	2000	lb	2000	lb	2000	lb
+ PISTON LOAD	620	lb	623	lb	645	lb		lb
= TOTAL LOAD	2620	lb	2623	lb	2645	lb		lb
WATER TEMPERATURE	27.6	C	28.1	C	28.0	C		C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00							

PRESSURES AND FLOW RATES

TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	1.31	25.5	1.31	25.7	1.32	26.6		
	STBD INNER AND OUTER	1.64	23.9	1.64	24.1	1.64	24.9		
AFTER RECESSES	PORT OUTER AND INNER	1.51	27.7	1.51	28.0	1.51	28.6		
	STBD INNER AND OUTER	1.47	37.5	1.47	38.7	1.48	41.3		
Summed Flow, Av.Press.		5.93	28.7	5.93	29.1	5.95	30.1		
FLOW BY GEMST		6.11		6.08		6.08			
MANIFOLD PRESSURE			85.8		86.0		87.2		
PISTON PRESSURE	sensor		99.7		100.3		103.1		
	gauge		98		98.5		102		

BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	1.13	94.6	1.18	95.6	1.37	97.9		
	PORT INNER	1.00		1.02		1.06			
	CENTRE	0.92	94.0	0.97	94.7	1.17	96.3		
	STBD INNER	1.40		1.46		1.70			
	STBD OUTER	2.91	88.9	2.98	89.3	3.21	90.5		
Summed Flow, Av.Press.		7.36	92.5	7.61	93.2	8.51	94.9		
FLOW BY GEMST		7.08		7.36		8.35			
MANIFOLD PRESSURE			101.9		102.5		105.9		

TOTAL FLOW TO BEARING

	Q	R	S	T
BY GEMST TOTALISER	13.19	13.44	14.43	

FLOAT OF SHAFT IN BOTTOM HALF BEARING

	Q	R	S	T
FORWARD DIAL GAUGE	.00200 in	.00204 in	.00228 in	.00010 in
AFTER DIAL GAUGE	.00177 in	.00183 in	.00208 in	.00004 in
Float at Centre	.001885in	.001935in	.00218 in	.00007 in

TABLE 20.3A

TABLE 20.3A

DECREASING MANIFOLD PRESSURES UNDER 3000 LB APPLIED LOAD

IMPOSED CONDITIONS

TEST SHEET 165 RESULTS	A		B		C		D	
VERTICAL LOADING:								
APPLIED LOAD	3000	lb	3000	lb	3000	lb	3000	lb
+ PISTON LOAD	689	lb	670	lb	658	lb	645	lb
= TOTAL LOAD	3689	lb	3670	lb	3658	lb	3645	lb
WATER TEMPERATURE	29.2	C	28.3	C	28.8	C	28.3	C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER	1.30	27.9	1.30	26.9	1.30	26.4	1.29	25.9
FORWARD RECESSES STBD INNER AND OUTER	1.61	26.5	1.61	25.5	1.60	24.9	1.60	24.5
AFTER RECESSES PORT OUTER AND INNER	1.49	27.3	1.50	26.3	1.50	25.8	1.49	25.3
AFTER RECESSES STBD INNER AND OUTER	1.45	37.4	1.46	32.9	1.46	30.8	1.45	28.8
Summed Flow, Av.Press.	5.85	29.8	5.87	27.9	5.86	26.9	5.83	26.1
FLOW BY GEMST	5.97		6.06		6.07		6.07	
MANIFOLD PRESSURE		86.1		85.6		85.4		84.6
PISTON PRESSURE sensor		108.9		105.9		104.3		102.8
gauge		109		106		104		102
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER	1.24	103.5	1.06	100.8	0.98	104.1	0.91	97.9
PORT INNER	1.10		1.05		1.02		0.99	
CENTRE	1.05	102.5	0.83	100.4	0.72	99.1	0.66	96.9
STBD INNER	1.62		1.36		1.23		1.10	
STBD OUTER	3.30	95.7	3.03	94.7	2.91	98.3	2.81	92.8
Summed Flow, Av.Press.	8.31	100.6	7.33	98.6	6.86	100.5	6.47	95.9
FLOW BY GEMST	8.08		7.03		6.49		6.04	
MANIFOLD PRESSURE		111.4		108.5		106.8		105.3
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	14.05		14.09		12.56		12.11	
FLOAT OF SHAFT IN BOTTOM HALF BEARING								
FORWARD DIAL GAUGE	.00088 in		.00162 in		.00150 in		.00138 in	
AFTER DIAL GAUGE	.00208 in		.00182 in		.00170 in		.00160 in	
Float at Centre	.00198 in		.00172 in		.00160 in		.00140 in	

TABLE 20.3A CONTINUATION TABLE 20.3A

DECREASING MANIFOLD PRESSURES UNDER 3000 LB APPLIED LOAD

IMPOSED CONDITIONS

TEST SHEET 165 RESULTS	E		F		G		H	
VERTICAL LOADING:								
APPLIED LOAD	3000	lb	3000	lb	3000	lb	3000	lb
+ PISTON LOAD	632	lb	620	lb	601	lb	594	lb
= TOTAL LOAD	3632	lb	3620	lb	3601	lb	3594	lb
WATER TEMPERATURE	28.6	C	28.3	C	28.5	C	28.7	C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER	1.29	25.6	1.29	25.2	1.28	24.2	1.28	23.8
FORWARD RECESSES STBD INNER AND OUTER	1.60	24.0	1.60	23.7	1.60	22.7	1.60	22.3
AFTER RECESSES PORT OUTER AND INNER	1.51	24.8	1.51	24.4	1.51	23.2	1.51	22.9
AFTER RECESSES STBD INNER AND OUTER	1.47	27.3	1.47	25.5	1.47	22.1	1.47	21.1
Summed Flow, Av.Press.	5.87	25.4	5.87	24.7	5.86	23.1	5.86	22.5
FLOW BY GEMST	6.11		6.09		6.09		6.16	
MANIFOLD PRESSURE		84.4		83.8		82.6		82.5
PISTON PRESSURE sensor		101.0		99.6		96.4		95.2
gauge		100		98		95		94
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER	0.85	96.7	0.78	95.3	0.67	92.2	0.65	90.8
PORT INNER	0.97		0.95		0.90		0.88	
CENTRE	0.63	96.3	0.60	94.5	0.54	91.6	0.53	90.5
STBD INNER	1.01		0.89		0.76		0.74	
STBD OUTER	2.73	91.7	2.63	91.1	2.45	88.4	2.38	87.4
Summed Flow, Av.Press.	6.19	94.9	5.85	93.6	5.32	90.7	5.18	89.6
FLOW BY GEMST	5.80		5.44		4.93		4.77	
MANIFOLD PRESSURE		103.9		101.8		98.6		97.0
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	11.91		11.53		11.02		10.93	
FLOAT OF SHAFT IN BOTTOM HALF BEARING								
FORWARD DIAL GAUGE	.00130	in	.00120	in	.00093	in	.00084	in
AFTER DIAL GAUGE	.00150	in	.00138	in	.00117	in	.00108	in
Float at Centre	.00140	in	.00129	in	.00105	in	.00096	in

TABLE 20.3A CONTINUATION TABLE 20.3A

DECREASING MANIFOLD PRESSURES UNDER 3000 LB APPLIED LOAD

IMPOSED CONDITIONS

TEST SHEET 165 RESULTS	I		J		K		L	
VERTICAL LOADING:								
APPLIED LOAD	3000	lb	3000	lb	3000	lb	3000	lb
+ PISTON LOAD	582	lb	569	lb	550	lb	528	lb
= TOTAL LOAD	3582	lb	3569	lb	3550	lb	3528	lb
WATER TEMPERATURE	28.1	C	28.5	C	28.4	C	28.2	C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00							

PRESSURES AND FLOW RATES

TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	1.28	23.5	1.27	22.8	1.26	22.2	1.25	21.2
	STBD INNER AND OUTER	1.59	21.9	1.58	21.2	1.57	20.6	1.56	19.4
AFTER RECESSES	PORT OUTER AND INNER	1.51	22.4	1.51	21.7	1.51	20.9	1.50	19.7
	STBD INNER AND OUTER	1.47	19.8	1.47	17.9	1.45	15.9	1.45	13.6
Summed Flow, Av.Press.		5.85	21.9	5.85	20.9	5.79	19.9	5.76	18.5
FLOW BY GEMST		6.10		6.15		6.09		6.08	
MANIFOLD PRESSURE			81.7		80.9		79.4		77.5
PISTON PRESSURE	sensor		93.8		91.7		89.0		85.5
	gauge		92		90		87		83.5

BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
	PORT OUTER	0.63	89.8	0.61	87.5	0.59	84.9	0.57	81.2
FWD/AFT PAIRS OF RECESSES	PORT INNER	0.86		0.82		0.78		0.73	
	CENTRE	0.52	89.3	0.50	86.9	0.49	84.6	0.48	80.7
	STBD INNER	0.72		0.69		0.67		0.65	
	STBD OUTER	2.31	86.6	2.20	84.7	2.08	82.5	1.92	79.2
Summed Flow, Av.Press.		5.04	88.6	4.82	86.4	4.61	84.0	4.35	80.4
FLOW BY GEMST		4.59		4.34		4.10		3.93	
MANIFOLD PRESSURE			96.4		93.9		91.3		87.1

TOTAL FLOW TO BEARING

BY GEMST TOTALISER	10.69	10.49	10.19	10.01

FLOAT OF SHAFT IN BOTTOM HALF BEARING

FORWARD DIAL GAUGE	.00075 in	.00060 in	.00042 in	.00022 in
AFTER DIAL GAUGE	.00099 in	.00081 in	.00060 in	.00032 in
Float at Centre	.00087 in	.000705in	.00051 in	.00027 in

TABLE 20.3A CONTINUATION TABLE 20.3A

DECREASING MANIFOLD PRESSURES UNDER 3000 LB APPLIED LOAD
- IMPOSED CONDITIONS

TEST SHEET 165 RESULTS	M		N		O			
VERTICAL LOADING:								
APPLIED LOAD	3000	lb	3000	lb	3000	lb		lb
+ PISTON LOAD	506	lb	487	lb	455	lb		lb
= TOTAL LOAD	3506	lb	3487	lb	3455	lb		lb
WATER TEMPERATURE	28.2	C	27.7	C	28.0	C		C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER	1.23	20.4	1.21	19.6	1.17	18.4		
FORWARD RECESSES STBD INNER AND OUTER	1.54	18.5	1.52	17.8	1.47	16.3		
AFTER RECESSES PORT OUTER AND INNER	1.47	18.8	1.45	18.0	1.41	16.9		
AFTER RECESSES STBD INNER AND OUTER	1.43	12.2	1.40	11.4	1.37	10.4		
Summed Flow, Av.Press.	5.67	17.5	5.58	16.7	5.42	15.5		
FLOW BY GEMST	6.01		5.95		5.73			
MANIFOLD PRESSURE		75.3		73.0		68.4		
PISTON PRESSURE sensor		82.4		79.3		73.9		
gauge		80		77		72		
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER	0.57	77.7	0.57	74.8	0.57	69.3		
PORT INNER	0.70		0.68		0.65			
CENTRE	0.47	77.3	0.47	74.3	0.47	68.9		
STBD INNER	0.64		0.64		0.63			
STBD OUTER	1.84	75.9	1.77	73.4	1.67	67.8		
Summed Flow, Av.Press.	4.22	76.9	4.13	74.1	3.99	68.7		
FLOW BY GEMST	3.87		3.83		3.79			
MANIFOLD PRESSURE		84.2		81.1		75.4		
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	9.88		9.78		9.52			
FLOAT OF SHAFT IN BOTTOM HALF BEARING								
FORWARD DIAL GAUGE	.00019 in		.00018 in		.00013 in			in
AFTER DIAL GAUGE	.00018 in		.00008 in		.00003 in			in
Float at Centre	.000185in		.00013 in		.00008 in			in

TABLE 20.3B

TABLE 20.3B

INCREASING MANIFOLD PRESSURES UNDER 3000 LB APPLIED LOAD
IMPOSED CONDITIONS

TEST SHEET 165 RESULTS		A		B		C		D	
VERTICAL LOADING:									
	APPLIED LOAD	3000	lb	3000	lb	3000	lb	3000	lb
	+ PISTON LOAD	455	lb	506	lb	550	lb	563	lb
	= TOTAL LOAD	3455	lb	3506	lb	3550	lb	3563	lb
WATER TEMPERATURE		27.6	C	27.8	C	27.6	C	27.1	C
OTHER CONDITIONS		Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	1.17	18.3	1.23	20.2	1.28	22.1	1.28	22.6
	STBD INNER AND OUTER	1.47	16.3	1.54	18.4	1.60	20.6	1.60	21.1
AFTER RECESSES	PORT OUTER AND INNER	1.41	16.9	1.47	18.6	1.52	21.3	1.52	21.9
	STBD INNER AND OUTER	1.37	10.4	1.43	12.0	1.47	15.1	1.48	16.0
Summed Flow, Av.Press.		5.42	15.5	5.67	17.3	5.87	19.8	5.88	20.4
FLOW BY GEMST		5.77		6.01		6.16		6.14	
MANIFOLD PRESSURE			68.3		75.0		80.2		81.1
PISTON PRESSURE	sensor		73.9		81.9		89.4		91.2
	gauge		72		80		87		89
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	0.57	69.0	0.57	77.6	0.57	85.3	0.57	87.0
	PORT INNER	0.65		0.68		0.73		0.74	
	CENTRE	0.47	68.7	0.47	77.0	0.48	84.7	0.48	86.9
	STBD INNER	0.63		0.64		0.65		0.66	
	STBD OUTER	1.67	67.9	1.77	75.9	1.93	83.4	1.97	85.5
Summed Flow, Av.Press.		3.99	68.5	4.13	76.8	4.36	84.5	4.42	86.5
FLOW BY GEMST		3.79		3.83		3.92		3.96	
MANIFOLD PRESSURE			75.5		83.8		91.8		93.2
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		9.56		9.84		10.08		10.10	
FLOAT OF SHAFT IN BOTTOM HALF BEARING									
FORWARD DIAL GAUGE		.00012 in		.00018 in		.00029 in		.00033 in	
AFTER DIAL GAUGE		.00002 in		.00008 in		.00030 in		.00037 in	
Float at Centre		.00007 in		.00013 in		.000295in		.00035 in	

TABLE 20.3B CONTINUATION TABLE 20.3B

INCREASING MANIFOLD PRESSURES UNDER 3000 LB APPLIED LOAD - IMPOSED CONDITIONS

TEST SHEET 165 RESULTS		E		F		G		H	
VERTICAL LOADING:									
	APPLIED LOAD	3000	lb	3000	lb	3000	lb	3000	lb
	+ PISTON LOAD	569	lb	585	lb	601	lb	613	lb
	= TOTAL LOAD	3569	lb	3585	lb	3601	lb	3616	lb
WATER TEMPERATURE		27.8	C	27.3	C	27.6	C	27.4	C
OTHER CONDITIONS		Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	1.29	22.8	1.29	23.5	1.30	23.8	1.31	24.5
	STBD INNER AND OUTER	1.60	21.5	1.61	22.0	1.63	22.5	1.63	23.3
AFTER RECESSES	PORT OUTER AND INNER	1.53	22.5	1.53	23.5	1.53	24.2	1.52	25.6
	STBD INNER AND OUTER	1.48	16.7	1.48	18.1	1.47	19.3	1.47	21.7
Summed Flow, Av.Press.		5.90	20.9	5.91	21.8	5.93	22.5	5.93	23.8
FLOW BY GEMST		6.17		6.16		6.19		6.19	
MANIFOLD PRESSURE			81.7		82.8		83.7		84.5
PISTON PRESSURE	sensor		92.4		94.9		96.2		98.5
	gauge		90		92.5		95		97
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	0.57	88.9	0.58	90.4	0.59	92.3	0.61	95.0
	PORT INNER	0.75		0.77		0.79		0.83	
	CENTRE	0.48	88.1	0.49	89.8	0.49	91.7	0.50	94.4
	STBD INNER	0.66		0.67		0.68		0.70	
	STBD OUTER	2.00	86.2	2.07	88.2	2.12	89.6	2.22	91.8
Summed Flow, Av.Press.		4.46	87.7	4.58	89.5	4.67	91.2	4.86	93.7
FLOW BY GEMST		3.98		4.08		4.19		4.34	
MANIFOLD PRESSURE			94.9		96.6		98.8		100.9
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		10.15		10.24		10.38		10.53	
FLOAT OF SHAFT IN BOTTOM HALF BEARING									
FORWARD DIAL GAUGE		.00038	in	.00049	in	.00057	in	.00070	in
AFTER DIAL GAUGE		.00040	in	.00050	in	.00057	in	.00070	in
Float at Centre		.00039	in	.000495	in	.00057	in	.00070	in

TABLE 20.3B CONTINUATION TABLE 20.3B

INCREASING MANIFOLD PRESSURES UNDER 3000 LB APPLIED LOAD

IMPOSED CONDITIONS

TEST SHEET 165 RESULTS		I		J		K		L	
VERTICAL LOADING:									
	APPLIED LOAD	3000	lb	3000	lb	3000	lb	3000	lb
	+ PISTON LOAD	620	lb	626	lb	632	lb	638	lb
	= TOTAL LOAD	3620	lb	3626	lb	3632	lb	3638	lb
WATER TEMPERATURE		27.9	C	27.8	C	27.9	C	27.4	C
OTHER CONDITIONS		Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	1.31	24.8	1.31	25.0	1.32	25.4	1.32	25.7
	STBD INNER AND OUTER	1.64	23.6	1.64	23.9	1.64	24.1	1.65	24.4
AFTER RECESSES	PORT OUTER AND INNER	1.52	26.5	1.51	27.7	1.51	28.2	1.51	28.4
	STBD INNER AND OUTER	1.47	23.4	1.46	25.7	1.47	27.5	1.47	29.3
Summed Flow, Av.Press.		5.94	24.6	5.92	25.6	5.94	26.3	5.95	26.9
FLOW BY GEMST		6.23		6.20		6.21		6.15	
MANIFOLD PRESSURE			85.1		85.6		86.1		86.7
PISTON PRESSURE	sensor		99.7		100.6		101.3		102.2
	gauge		98		99		100		101
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	0.63	95.9	0.65	96.5	0.69	97.3	0.73	97.9
	PORT INNER	0.85		0.88		0.90		0.92	
	CENTRE	0.51	95.2	0.53	96.0	0.55	96.9	0.57	97.2
	STBD INNER	0.72		0.75		0.77		0.84	
	STBD OUTER	2.28	92.5	2.37	93.4	2.44	93.6	2.52	94.0
Summed Flow, Av.Press.		4.99	94.5	5.18	95.3	5.35	95.9	5.58	96.4
FLOW BY GEMST		4.54		4.74		4.97		5.18	
MANIFOLD PRESSURE			102.5		103.1		104.1		104.8
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		10.77		10.94		11.18		11.33	
FLOAT OF SHAFT IN BOTTOM HALF BEARING									
FORWARD DIAL GAUGE		.00082	in	.00098	in	.00108	in	.00120	in
AFTER DIAL GAUGE		.00082	in	.00098	in	.00108	in	.00120	in
Float at Centre		.00082	in	.00098	in	.00108	in	.00120	in

INCREASING MANIFOLD PRESSURES UNDER 3000 LB APPLIED LOAD
IMPOSED CONDITIONS

TEST SHEET 165 RESULTS		M		N		O		P	
VERTICAL LOADING:									
	APPLIED LOAD	3000	lb	3000	lb	3000	lb	3000	lb
	+ PISTON LOAD	645	lb	648	lb	651	lb	658	lb
	= TOTAL LOAD	3645	lb	3648	lb	3651	lb	3658	lb
WATER TEMPERATURE		27.9	C	27.9	C	27.9	C	27.9	C
OTHER CONDITIONS		Fixed for the test series, given in Table 20.00							

PRESSURES AND FLOW RATES

TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	1.32	25.9	1.32	26.2	1.32	26.4	1.33	26.7
	STBD INNER AND OUTER	1.65	24.7	1.65	25.1	1.65	25.3	1.66	25.5
AFTER RECESSES	PORT OUTER AND INNER	1.52	28.6	1.52	28.7	1.51	28.9	1.52	29.0
	STBD INNER AND OUTER	1.47	30.9	1.47	32.6	1.47	34.0	1.47	35.3
Summed Flow, Av.Press.		5.96	27.5	5.96	28.2	5.95	28.7	5.98	29.1
FLOW BY GEMST		6.19		6.16		6.15		6.15	
MANIFOLD PRESSURE			87.2		87.4		87.5		87.9
PISTON PRESSURE	sensor		103.4		103.8		104.8		105.5
	gauge		102		102.5		103		104

BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	0.79	98.8	0.85	99.4	0.91	100.1	0.96	100.9
	PORT INNER	0.94		0.96		0.97		0.99	
	CENTRE	0.60	98.2	0.63	98.8	0.67	99.3	0.71	100.2
	STBD INNER	0.90		0.91		0.91		0.95	
	STBD OUTER	2.60	94.5	2.68	95.2	2.74	95.5	2.81	95.9
Summed Flow, Av.Press.		5.83	97.2	6.03	97.8	6.20	98.3	6.42	99.0
FLOW BY GEMST		5.40		5.70		5.96		6.24	
MANIFOLD PRESSURE			105.7		106.4		107.9		108.4

TOTAL FLOW TO BEARING

	M	N	O	P
BY GEMST TOTALISER	11.59	11.86	12.11	12.39

FLOAT OF SHAFT IN BOTTOM HALF BEARING

	M	N	O	P
FORWARD DIAL GAUGE	.00130 in	.00140 in	.00151 in	.00160 in
AFTER DIAL GAUGE	.00130 in	.00142 in	.00150 in	.00158 in
Float at Centre	.00130 in	.00141 in	.001505in	.00159 in

TABLE 20.3B CONTINUATION TABLE 20.3B

INCREASING MANIFOLD PRESSURES UNDER 3000 LB APPLIED LOAD

IMPOSED CONDITIONS

TEST SHEET 165 RESULTS		Q		R		S		T	
VERTICAL LOADING:									
	APPLIED LOAD	3000	lb	3000	lb	3000	lb	3000	lb
	+ PISTON LOAD	664	lb	670	lb	677	lb	689	lb
	= TOTAL LOAD	3664	lb	3670	lb	3677	lb	3689	lb
WATER TEMPERATURE		27.4	C	27.6	C	27.6	C	27.8	C
OTHER CONDITIONS		Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	1.33	26.9	1.33	27.2	1.33	27.7	1.33	27.9
	STBD INNER AND OUTER	1.66	25.8	1.66	26.1	1.66	26.6	1.66	26.8
AFTER RECESSES	PORT OUTER AND INNER	1.52	29.3	1.51	29.4	1.51	30.0	1.52	29.9
	STBD INNER AND OUTER	1.47	36.9	1.48	38.3	1.48	40.4	1.48	41.5
Summed Flow, Av.Press.		5.98	29.7	5.98	30.3	5.98	31.2	5.99	31.5
FLOW BY GEMST		6.13		6.12		6.11		6.12	
MANIFOLD PRESSURE			88.2		88.8		88.7		89.2
PISTON PRESSURE	sensor		106.8		107.6		108.9		109.9
	gauge		105		106		107		109
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	1.03	102.0	1.10	102.8	1.18	103.9	1.25	104.8
	PORT INNER	1.01		1.03		1.05		1.07	
	CENTRE	0.79	100.9	0.88	101.9	0.98	102.9	1.06	103.4
	STBD INNER	1.05		1.15		1.26		1.35	
	STBD OUTER	2.89	96.6	2.98	97.2	3.08	97.8	3.18	98.2
Summed Flow, Av.Press.		6.77	99.8	7.14	100.6	7.55	101.5	7.91	102.1
FLOW BY GEMST		6.62		6.96		7.42		7.88	
MANIFOLD PRESSURE			109.4		110.7		111.9		113.0
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		12.75		13.08		13.53		14.00	
FLOAT OF SHAFT IN BOTTOM HALF BEARING									
FORWARD DIAL GAUGE		.00170	in	.00180	in	.00192	in	.00200	in
AFTER DIAL GAUGE		.00168	in	.00180	in	.00190	in	.00200	in
Float at Centre		.00169	in	.00180	in	.00191	in	.00200	in

TABLE 20.4A

TABLE 20.4A

DECREASING MANIFOLD PRESSURES UNDER 4000 LB APPLIED LOAD

IMPOSED CONDITIONS

TEST SHEET 164 RESULTS		A		B		C		D	
VERTICAL LOADING:									
	APPLIED LOAD	4000	lb	4000	lb	4000	lb	4000	lb
	+ PISTON LOAD	917	lb	904	lb	898	lb	885	lb
	= TOTAL LOAD	4917	lb	4904	lb	4898	lb	4885	lb
WATER TEMPERATURE		28.2	C	28.6	C	28.9	C	28.3	C
OTHER CONDITIONS		Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	1.25	36.6	1.25	35.7	1.24	35.4	1.23	34.7
	STBD INNER AND OUTER	1.55	36.3	1.55	35.8	1.54	35.3	1.52	34.7
AFTER RECESSES	PORT OUTER AND INNER	1.55	36.3	1.43	36.7	1.43	35.5	1.43	34.5
	STBD INNER AND OUTER	1.39	50.0	1.36	47.3	1.38	44.9	1.38	41.6
Summed Flow, Av.Press.		5.61	40.3	5.59	38.9	5.59	37.8	5.56	36.4
FLOW BY GEMST		5.75		5.72		5.70		5.69	
MANIFOLD PRESSURE			93.0		92.4		91.4		89.5
PISTON PRESSURE	sensor		143.9		142.5		141.4		138.8
	gauge		145		143		142		140
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	1.43	138.5	1.33	137.1	1.26	135.6	1.14	133.9
	PORT INNER	1.26		1.24		1.22		1.19	
	CENTRE	1.21	138.0	1.12	136.8	1.04	135.4	0.91	134.1
	STBD INNER	1.86		1.75		1.64		1.47	
	STBD OUTER	3.77	128.4	3.68	128.0	3.56	127.3	3.43	126.0
Summed Flow, Av.Press.		9.53	134.9	9.12	133.9	8.72	132.8	8.14	131.3
FLOW BY GEMST		9.42		8.90		8.48		7.94	
MANIFOLD PRESSURE			148.0		146.3		145.0		143.2
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		15.17		14.62		14.18		13.63	
FLOAT OF SHAFT IN BOTTOM HALF BEARING									
FORWARD DIAL GAUGE		.00197	in	.00183	in	.00173	in	.00157	in
AFTER DIAL GAUGE		.00208	in	.00199	in	.00190	in	.00180	in
Float at Centre		.002025	in	.00191	in	.001815	in	.001685	in

DECREASING MANIFOLD PRESSURES UNDER 4000 LB APPLIED LOAD IMPOSED CONDITIONS									
TEST SHEET 164 RESULTS		E		F		G		H	
VERTICAL LOADING:									
	APPLIED LOAD	4000	lb	4000	lb	4000	lb	4000	lb
	+ PISTON LOAD	872	lb	860	lb	854	lb	835	lb
	= TOTAL LOAD	4872	lb	4860	lb	4854	lb	4835	lb
WATER TEMPERATURE		28.8	C	29.1	C	28.5	C	28.8	C
OTHER CONDITIONS		Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	1.22	34.3	1.23	33.6	1.24	33.1	1.24	32.5
	STBD INNER AND OUTER	1.51	34.3	1.52	33.6	1.53	33.1	1.54	32.4
AFTER RECESSES	PORT OUTER AND INNER	1.42	33.9	1.43	33.3	1.44	32.8	1.45	32.1
	STBD INNER AND OUTER	1.37	39.3	1.39	36.6	1.40	34.6	1.42	32.2
Summed Flow, Av.Press.		5.52	35.4	5.57	34.5	5.61	33.4	5.65	32.3
FLOW BY GEMST		5.71		5.76		5.81		5.84	
MANIFOLD PRESSURE			88.6		88.4		88.6		88.3
PISTON PRESSURE	sensor		137.7		135.9		133.5		131.2
	gauge		138		136		135		132
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	1.07	132.8	0.97	130.9	0.89	129.1	0.77	127.6
	PORT INNER	1.17		1.14		1.10		1.06	
	CENTRE	0.82	132.9	0.69	130.7	0.63	129.5	0.59	127.7
	STBD INNER	1.37		1.21		1.08		0.89	
	STBD OUTER	3.33	125.8	3.19	124.2	3.09	123.2	2.95	121.9
Summed Flow, Av.Press.		7.76	130.5	7.20	128.6	6.79	127.3	6.26	125.7
FLOW BY GEMST		7.49		6.83		6.39		5.84	
MANIFOLD PRESSURE			141.8		138.8		137.2		135.2
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		13.20		12.59		12.20		11.68	
FLOAT OF SHAFT IN BOTTOM HALF BEARING									
FORWARD DIAL GAUGE		.00147	in	.00131	in	.00120	in	.00103	in
AFTER DIAL GAUGE		.00173	in	.00159	in	.00146	in	.00131	in
Float at Centre		.00160	in	.00145	in	.00133	in	.00117	in

TABLE 20.4A CONTINUATION TABLE 20.4A

DECREASING MANIFOLD PRESSURES UNDER 4000 LB APPLIED LOAD
IMPOSED CONDITIONS

TEST SHEET 164 RESULTS	I	J	K	L
VERTICAL LOADING:				
APPLIED LOAD	4000 lb	4000 lb	4000 lb	4000 lb
+ PISTON LOAD	822 lb	816 lb	797 lb	784 lb
= TOTAL LOAD	4822 lb	4816 lb	4797 lb	4784 lb
WATER TEMPERATURE	28.6 C	29.3 C	29.3 C	29.3 C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00			

PRESSURES AND FLOW RATES

TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	1.25	31.9	1.26	31.5	1.27	31.0	1.28	30.2
	STBD INNER AND OUTER	1.54	31.9	1.55	31.4	1.56	30.9	1.57	30.0
AFTER RECESSES	PORT OUTER AND INNER	1.46	31.4	1.47	30.8	1.48	30.2	1.49	29.4
	STBD INNER AND OUTER	1.43	30.0	1.44	28.5	1.45	26.7	1.46	24.6
Summed Flow, Av.Press.		5.68	31.3	5.72	30.6	5.76	29.7	5.80	28.6
FLOW BY GEMST		5.88		5.98		5.98		6.09	
MANIFOLD PRESSURE			88.0		88.3		88.0		88.0
PISTON PRESSURE	sensor		129.1		127.6		126.0		123.4
	gauge		130		129		126		124

BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	0.69	125.6	0.65	124.4	0.62	122.3	0.60	120.2
	PORT INNER	1.02		0.99		0.95		0.90	
	CENTRE	0.55	125.6	0.53	124.6	0.51	122.0	0.49	120.2
	STBD INNER	0.81		0.75		0.72		0.69	
	STBD OUTER	2.84	120.4	2.75	119.4	2.66	117.9	2.54	115.8
Summed Flow, Av.Press.		5.91	123.9	5.67	122.8	5.46	120.6	5.22	118.7
FLOW BY GEMST		5.44		5.19		4.88		4.59	
MANIFOLD PRESSURE			133.3		131.6		129.4		127.3

TOTAL FLOW TO BEARING

	I	J	K	L
BY GEMST TOTALISER	11.32	11.17	10.86	10.68

FLOAT OF SHAFT IN BOTTOM HALF BEARING

	I	J	K	L
FORWARD DIAL GAUGE	.00088 in	.00080 in	.00064 in	.00049 in
AFTER DIAL GAUGE	.00118 in	.00106 in	.00094 in	.00073 in
Float at Centre	.00103 in	.00093 in	.00079 in	.00061 in

TABLE 20.4A CONTINUATION TABLE 20.4A

DECREASING MANIFOLD PRESSURES UNDER 4000 LB APPLIED LOAD
IMPOSED CONDITIONS

TEST SHEET 164 RESULTS	M		N		O		P	
VERTICAL LOADING:								
APPLIED LOAD	4000	lb	4000	lb	4000	lb	4000	lb
+ PISTON LOAD	775	lb	759	lb	683	lb	626	lb
= TOTAL LOAD	4775	lb	4759	lb	4683	lb	4626	lb
WATER TEMPERATURE	28.7	C	28.9	C	29.5	C	28.9	C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER	1.29	30.1	1.29	29.4	1.30	26.7	1.28	24.6
FORWARD RECESSES STBD INNER AND OUTER	1.58	29.9	1.59	29.0	1.62	26.1	1.60	23.5
AFTER RECESSES PORT OUTER AND INNER	1.49	29.2	1.50	28.4	1.54	25.6	1.52	24.3
AFTER RECESSES STBD INNER AND OUTER	1.46	23.9	1.47	22.4	1.50	18.8	1.48	17.6
Summed Flow, Av.Press.	5.82	28.3	5.85	27.3	5.96	24.3	5.88	22.5
FLOW BY GEMST	6.05		6.13		6.22		6.17	
MANIFOLD PRESSURE		87.6		87.4		86.4		83.7
PISTON PRESSURE sensor		122.3		119.3		108.7		99.4
gauge		122.5		120		108		99
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER	0.59	119.0	0.57	116.4	0.56	105.6	0.56	95.7
PORT INNER	0.88		0.84		0.77		0.74	
CENTRE	0.49	118.6	0.48	115.9	0.46	105.3	0.46	95.4
STBD INNER	0.67		0.65		0.63		0.62	
STBD OUTER	2.48	115.1	2.39	113.2	2.13	102.9	1.96	93.7
Summed Flow, Av.Press.	5.11	117.6	4.93	115.2	4.55	104.6	4.34	95.0
FLOW BY GEMST	4.47		4.25		3.98		3.89	
MANIFOLD PRESSURE		125.5		122.9		111.4		102.0
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	10.52		10.38		10.20		10.06	
FLOAT OF SHAFT IN BOTTOM HALF BEARING								
FORWARD DIAL GAUGE	.00038	in	.00027	in	.00015	in	.00010	in
AFTER DIAL GAUGE	.00067	in	.00048	in	.00010	in	.00002	in
Float at Centre	.000525	in	.000375	in	.000125	in	.00006	in

TABLE 20.4A CONTINUATION TABLE 20.4A

DECREASING MANIFOLD PRESSURES UNDER 4000 LB APPLIED LOAD

IMPOSED CONDITIONS

TEST SHEET 164 RESULTS	Q			
VERTICAL LOADING:				
APPLIED LOAD	4000 lb	lb	lb	lb
+ PISTON LOAD	582 lb	lb	lb	lb
= TOTAL LOAD	4582 lb	lb	lb	lb
WATER TEMPERATURE	29.3 C	C	C	C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00			

PRESSURES AND FLOW RATES

TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
PORT OUTER	1.27	23.2						
FORWARD AND INNER								
RECESSES STBD INNER	1.60	21.9						
AND OUTER								
PORT OUTER	1.51	23.7						
AFTER AND INNER								
RECESSES STBD INNER	1.46	16.8						
AND OUTER								
Summed Flow, Av.Press.	5.84	21.4						
FLOW BY GEMST	6.14							
MANIFOLD PRESSURE		82.0						
PISTON PRESSURE sensor		93.8						
gauge		92						

BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
PORT OUTER	0.56	89.8						
FWD/AFT PORT INNER	0.72							
PAIRS OF CENTRE	0.46	89.4						
RECESSES STBD INNER	0.62							
STBD OUTER	1.86	87.8						
Summed Flow, Av.Press.	4.22	89.0						
FLOW BY GEMST	3.85							
MANIFOLD PRESSURE		95.8						

TOTAL FLOW TO BEARING

BY GEMST TOTALISER	9.99			

FLOAT OF SHAFT IN BOTTOM HALF BEARING

FORWARD DIAL GAUGE	.00005 in	in	in	in
AFTER DIAL GAUGE	.00000 in	in	in	in
Float at Centre	.000025in	in	in	in

TABLE 20.4B

TABLE 20.4B

INCREASING MANIFOLD PRESSURES UNDER 4000 LB APPLIED LOAD
IMPOSED CONDITIONS

TEST SHEET 164 RESULTS	A		B		C		D	
VERTICAL LOADING:								
APPLIED LOAD	4000	lb	4000	lb	4000	lb	4000	lb
+ PISTON LOAD	582	lb	702	lb	746	lb	765	lb
= TOTAL LOAD	4582	lb	4702	lb	4746	lb	4765	lb
WATER TEMPERATURE	29.2	C	29.4	C	29.4	C	29.1	C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER	1.27	23.2	1.32	27.3	1.33	28.7	1.33	29.4
FORWARD RECESSES STBD INNER AND OUTER	1.60	21.9	1.65	26.8	1.65	28.5	1.66	29.3
AFTER RECESSES PORT OUTER AND INNER	1.51	23.8	1.57	26.3	1.57	27.7	1.56	28.9
AFTER RECESSES STBD INNER AND OUTER	1.47	16.9	1.53	19.3	1.52	20.9	1.52	22.2
Summed Flow, Av.Press.	5.85	21.5	6.07	24.9	6.07	26.4	6.07	27.4
FLOW BY GEMST	6.12		6.34		6.32		6.32	
MANIFOLD PRESSURE		81.9		89.0		90.3		90.8
PISTON PRESSURE sensor		94.5		111.2		117.8		120.1
gauge		92		111		118		121
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER	0.56	89.9	0.56	107.8	0.56	114.9	0.56	117.2
PORT INNER	0.72		0.76		0.78		0.80	
CENTRE	0.46	89.2	0.47	107.6	0.47	113.5	0.47	116.6
STBD INNER	0.62		0.63		0.63		0.64	
STBD OUTER	1.85	87.9	2.12	105.2	2.24	111.6	2.29	114.3
Summed Flow, Av.Press.	4.21	89.0	4.54	106.8	4.68	113.3	4.76	116.0
FLOW BY GEMST	3.85		3.97		4.05		4.11	
MANIFOLD PRESSURE		95.9		114.0		121.0		123.6
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	9.97		10.31		10.37		10.43	
FLOAT OF SHAFT IN BOTTOM HALF BEARING								
FORWARD DIAL GAUGE	.00006	in	.00013	in	.00018	in	.00019	in
AFTER DIAL GAUGE	.00000	in	.00007	in	.00014	in	.00023	in
Float at Centre	.00003	in	.00010	in	.00016	in	.00021	in

TABLE 20.4B CONTINUATION TABLE 20.4B

INCREASING MANIFOLD PRESSURES UNDER 4000 LB APPLIED LOAD
- IMPOSED CONDITIONS

TEST SHEET 164 RESULTS	E		F		G		H	
VERTICAL LOADING:								
APPLIED LOAD	4000	lb	4000	lb	4000	lb	4000	lb
+ PISTON LOAD	797	lb	816	lb	828	lb	835	lb
= TOTAL LOAD	4797	lb	4816	lb	4828	lb	4835	lb
WATER TEMPERATURE	29.1	C	29.1	C	29.6	C	29.3	C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00							

PRESSURES AND FLOW RATES

TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER	1.33	30.6	1.33	31.4	1.33	31.8	1.32	32.3
FORWARD RECESSES STBD INNER AND OUTER	1.64	30.7	1.64	31.5	1.63	31.9	1.62	32.5
AFTER RECESSES PORT OUTER AND INNER	1.53	31.1	1.52	32.6	1.51	33.5	1.49	34.8
AFTER RECESSES STBD INNER AND OUTER	1.48	25.4	1.47	27.6	1.46	29.2	1.44	31.4
Summed Flow, Av.Press.	5.98	29.4	5.96	30.8	5.93	31.6	5.87	32.8
FLOW BY GEMST	6.25		6.23		6.23		6.18	
MANIFOLD PRESSURE		91.8		92.3		92.5		92.6
PISTON PRESSURE sensor		125.2		128.0		130.0		131.6
gauge		126		129		131		132

BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER	0.58	122.2	0.59	125.8	0.60	126.9	0.62	128.9
PORT INNER	0.85		0.88		0.91		0.95	
CENTRE	0.48	121.8	0.49	125.4	0.49	126.8	0.51	128.8
STBD INNER	0.65		0.67		0.68		0.70	
STBD OUTER	2.41	118.5	2.50	121.4	2.58	122.8	2.67	124.2
Summed Flow, Av.Press.	4.97	120.5	5.13	124.2	5.26	125.5	5.45	127.6
FLOW BY GEMST	4.29		4.48		4.64		4.88	
MANIFOLD PRESSURE		128.3		131.6		133.9		135.6

TOTAL FLOW TO BEARING

	E	F	G	H
BY GEMST TOTALISER	10.54	10.71	10.87	11.06

FLOAT OF SHAFT IN BOTTOM HALF BEARING

	E	F	G	H
FORWARD DIAL GAUGE	.00027 in	.00038 in	.00048 in	.00060 in
AFTER DIAL GAUGE	.00043 in	.00058 in	.00068 in	.00080 in
Float at Centre	.00035 in	.00048 in	.00058 in	.00070 in

TABLE 20.4B CONTINUATION TABLE 20.4B

INCREASING MANIFOLD PRESSURES UNDER 4000 LB APPLIED LOAD

IMPOSED CONDITIONS

TEST SHEET 164 RESULTS		I		J		K		L	
VERTICAL LOADING:									
	APPLIED LOAD	4000	lb	4000	lb	4000	lb	4000	lb
	+ PISTON LOAD	841	lb	847	lb	854	lb	860	lb
	= TOTAL LOAD	4841	lb	4847	lb	4854	lb	4860	lb
WATER TEMPERATURE		29.5	C	29.6	C	29.3	C	29.7	C
OTHER CONDITIONS		Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	1.32	32.6	1.32	32.9	1.31	33.3	1.31	33.7
	STBD INNER AND OUTER	1.62	32.8	1.62	33.0	1.61	33.5	1.61	33.9
AFTER RECESSES	PORT OUTER AND INNER	1.47	35.6	1.47	36.2	1.46	36.5	1.46	36.9
	STBD INNER AND OUTER	1.35	33.1	1.43	34.4	1.43	37.2	1.42	39.4
Summed Flow, Av.Press.		5.76	33.5	5.84	34.1	5.81	35.1	5.80	35.9
FLOW BY GEMST		6.13		6.13		6.07		6.04	
MANIFOLD PRESSURE			92.9		92.8		93.2		93.4
PISTON PRESSURE	sensor		132.8		133.8		134.9		135.6
	gauge		133		134		135		136
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	0.64	129.3	0.66	129.8	0.74	131.6	0.82	132.0
	PORT INNER	0.99		1.01		1.06		1.08	
	CENTRE	0.52	129.3	0.53	129.7	0.57	131.4	0.61	132.5
	STBD INNER	0.72		0.74		0.87		0.96	
	STBD OUTER	2.74	124.5	2.79	125.3	2.93	125.8	3.03	126.4
Summed Flow, Av.Press.		5.61	127.7	5.73	128.3	6.17	129.6	6.50	130.3
FLOW BY GEMST		5.06		5.22		5.64		6.06	
MANIFOLD PRESSURE			136.4		136.7		138.7		139.9
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		11.19		11.35		11.71		12.10	
FLOAT OF SHAFT IN BOTTOM HALF BEARING									
FORWARD DIAL GAUGE		.00070 in		.00078 in		.00096 in		.00109 in	
AFTER DIAL GAUGE		.00090 in		.00097 in		.00104 in		.00128 in	
Float at Centre		.00080 in		.000875in		.00100 in		.001185in	

TABLE 20.4B CONTINUATION TABLE 20.4B

INCREASING MANIFOLD PRESSURES UNDER 4000 LB APPLIED LOAD
IMPOSED CONDITIONS

TEST SHEET 164 RESULTS		M		N		O		P	
VERTICAL LOADING:									
	APPLIED LOAD	4000	lb	4000	lb	4000	lb	4000	lb
	+ PISTON LOAD	847	lb	879	lb	885	lb	892	lb
	= TOTAL LOAD	4847	lb	4879	lb	4885	lb	4892	lb
WATER TEMPERATURE		29.1	C	29.6	C	29.0	C	29.4	C
OTHER CONDITIONS		Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	1.30	34.1	1.30	34.4	1.30	34.6	1.29	35.2
	STBD INNER AND OUTER	1.60	34.3	1.60	34.7	1.60	34.9	1.60	35.4
AFTER RECESSES	PORT OUTER AND INNER	1.46	36.9	1.46	37.3	1.46	37.5	1.46	37.8
	STBD INNER AND OUTER	1.42	40.8	1.43	42.6	1.43	43.8	1.40	45.8
Summed Flow, Av.Press.		5.78	36.5	5.79	37.3	5.79	37.7	5.75	38.6
FLOW BY GEMST		6.02		6.01		6.00		5.96	
MANIFOLD PRESSURE			93.5		93.7		93.9		93.8
PISTON PRESSURE	sensor		136.9		138.1		138.8		141.2
	gauge		137		139		140		141
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	0.90	132.7	0.99	134.2	1.04	134.4	1.15	136.2
	PORT INNER	1.11		1.14		1.16		1.20	
	CENTRE	0.64	133.0	0.71	134.1	0.78	134.5	0.91	135.7
	STBD INNER	1.09		1.22		1.30		1.46	
	STBD OUTER	3.11	126.8	3.23	127.1	3.29	127.7	3.42	128.2
Summed Flow, Av.Press.		6.85	130.8	7.29	131.8	7.57	132.2	8.14	133.3
FLOW BY GEMST		6.39		6.98		7.24		7.85	
MANIFOLD PRESSURE			140.6		142.9		143.0		144.9
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		12.41		12.99		13.24		13.81	
FLOAT OF SHAFT IN BOTTOM HALF BEARING									
FORWARD DIAL GAUGE		.00119	in	.00130	in	.00149	in	.00154	in
AFTER DIAL GAUGE		.00137	in	.00150	in	.00153	in	.00170	in
Float at Centre		.00128	in	.00140	in	.00151	in	.00162	in

TABLE 20.4B CONTINUATION TABLE 20.4B

INCREASING MANIFOLD PRESSURES UNDER 4000 LB APPLIED LOAD
- IMPOSED CONDITIONS

TEST SHEET 164 RESULTS	Q		R		S		T	
VERTICAL LOADING:								
APPLIED LOAD	4000	lb	4000	lb	4000	lb		lb
+ PISTON LOAD	901	lb	917	lb	923	lb		lb
= TOTAL LOAD	4901	lb	4917	lb	4923	lb		lb
WATER TEMPERATURE	29.1	C	29.5	C	29.6	C		C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00							

PRESSURES AND FLOW RATES

TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	1.29	35.6	1.29	35.9	1.28	36.6		
	STBD INNER AND OUTER	1.59	35.9	1.59	36.3	1.58	36.9		
AFTER RECESSES	PORT OUTER AND INNER	1.46	38.3	1.45	38.3	1.44	38.7		
	STBD INNER AND OUTER	1.40	47.4	1.40	48.3	1.39	50.3		
Summed Flow, Av.Press.		5.74	39.3	5.73	39.7	5.69	40.6		
FLOW BY GEMST		5.95		5.93		5.87			
MANIFOLD PRESSURE			94.2		94.1		94.4		
PISTON PRESSURE	sensor		141.9		143.4		146.0		
	gauge		142.5		145		146		

BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	1.25	136.9	1.35	138.5	1.52	140.2		
	PORT INNER	1.24		1.27		1.32			
	CENTRE	1.02	136.7	1.12	137.9	1.29	139.6		
	STBD INNER	1.57		1.70		1.91			
	STBD OUTER	3.53	129.6	3.62	129.7	3.80	131.2		
Summed Flow, Av.Press.		8.61	134.4	9.06	135.4	9.84	137.0		
FLOW BY GEMST		8.38		8.88		9.73			
MANIFOLD PRESSURE			146.2		147.5		149.3		

TOTAL FLOW TO BEARING

	Q	R	S	T
BY GEMST TOTALISER	14.33	14.81	15.60	

FLOAT OF SHAFT IN BOTTOM HALF BEARING

	Q	R	S	T
FORWARD DIAL GAUGE	.00162 in	.00173 in	.00191 in	in
AFTER DIAL GAUGE	.00180 in	.00190 in	.00209 in	in
Float at Centre	.00171 in	.001815in	.00200 in	in

TABLE 20.5A TABLE 20.5A

DECREASING MANIFOLD PRESSURES UNDER 5000 LB APPLIED LOAD
IMPOSED CONDITIONS

TEST SHEET 159 RESULTS		A		B		C		D	
VERTICAL LOADING:									
	APPLIED LOAD	5000	lb	5000	lb	5000	lb	5000	lb
	+ PISTON LOAD	1006	lb	980	lb	968	lb	936	lb
	= TOTAL LOAD	6006	lb	5980	lb	5968	lb	5936	lb
WATER TEMPERATURE		26.9	C	27.3	C	27.6	C	27.5	C
OTHER CONDITIONS		Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	1.35	39.7	1.32	38.5	1.31	37.8	1.29	37.0
	STBD INNER AND OUTER	1.53	40.5	1.50	39.3	1.49	38.0	1.47	37.7
AFTER RECESSES	PORT OUTER AND INNER	1.41	41.3	1.40	37.7	1.40	36.5	1.38	35.5
	STBD INNER AND OUTER	1.06	52.7	1.07	46.2	1.10	43.5	1.17	35.9
Summed Flow, Av.Press.		5.35	43.5	5.29	40.4	5.30	38.9	5.31	36.5
FLOW BY GEMST		5.74		5.76		5.72		5.69	
MANIFOLD PRESSURE			96.0		92.5		91.2		89.0
PISTON PRESSURE	sensor		157.5		153.0		151.9		148.4
	gauge		159		155		153		148
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	1.35	153.0	1.16	149.0	1.09	147.8	0.96	145.0
	PORT INNER	1.25		1.20		1.17		1.12	
	CENTRE	1.13	152.0	0.93	148.9	0.84	147.5	0.70	144.7
	STBD INNER	1.67		1.48		1.40		1.22	
	STBD OUTER	3.67	143.0	3.45	141.0	3.35	140.0	3.19	138.4
Summed Flow, Av.Press.		9.07	149.3	8.22	146.3	7.85	145.1	7.19	142.7
FLOW BY GEMST		8.97		8.03		7.54		6.78	
MANIFOLD PRESSURE			161.9		158.4		156.2		153.3
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		14.71		13.79		13.26		12.47	
FLOAT OF SHAFT IN BOTTOM HALF BEARING									
FORWARD DIAL GAUGE		.00210	in	.00182	in	.00168	in	.00148	in
AFTER DIAL GAUGE		.00190	in	.00176	in	.00168	in	.00150	in
Float at Centre		.00200	in	.00179	in	.00168	in	.00149	in

TABLE 20.5A CONTINUATION TABLE 20.5A

DECREASING MANIFOLD PRESSURES UNDER 5000 LB APPLIED LOAD

IMPOSED CONDITIONS

TEST SHEET 159 RESULTS	E		F		G		H	
VERTICAL LOADING:								
APPLIED LOAD	5000	lb	5000	lb	5000	lb	5000	lb
+ PISTON LOAD	923	lb	904	lb	898	lb	873	lb
= TOTAL LOAD	5923	lb	5904	lb	5898	lb	5873	lb
WATER TEMPERATURE	27.7	C	27.8	C	27.9	C	27.5	C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER	1.30	36.0	1.31	35.3	1.32	34.9	1.33	33.8
FORWARD RECESSES STBD INNER AND OUTER	1.50	36.7	1.50	35.9	1.50	35.5	1.51	34.0
AFTER RECESSES PORT OUTER AND INNER	1.40	34.6	1.41	33.8	1.41	33.3	1.43	32.0
AFTER RECESSES STBD INNER AND OUTER	1.17	36.2	1.20	33.3	1.22	31.9	1.27	28.0
Summed Flow, Av.Press.	5.37	35.9	5.42	34.6	5.45	33.9	5.54	31.9
FLOW BY GEMST	5.75		5.87		5.89		5.95	
MANIFOLD PRESSURE		88.8		89.0		88.8		88.8
PISTON PRESSURE sensor		145.0		142.8		141.0		137.0
gauge		146		143		142		138
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER	0.80	142.5	0.69	139.8	0.66	138.5	0.60	135.0
PORT INNER	1.07		1.01		0.98		0.91	
CENTRE	0.60	142.0	0.54	139.7	0.52	138.0	0.49	134.5
STBD INNER	0.93		0.81		0.77		0.71	
STBD OUTER	2.98	136.5	2.83	126.3	2.76	133.5	2.59	130.5
Summed Flow, Av.Press.	6.38	140.3	5.88	135.3	5.69	136.7	5.30	133.3
FLOW BY GEMST	5.90		5.38		5.15		4.65	
MANIFOLD PRESSURE		149.2		147.0		144.9		141.7
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	11.65		11.25		11.04		10.60	
FLOAT OF SHAFT IN BOTTOM HALF BEARING								
FORWARD DIAL GAUGE	.00125	in	.00103	in	.00094	in	.00068	in
AFTER DIAL GAUGE	.00129	in	.00112	in	.00103	in	.00078	in
Float at Centre	.00127	in	.001075	in	.000985	in	.00073	in

TABLE 20.5A CONTINUATION TABLE 20.5A

DECREASING MANIFOLD PRESSURES UNDER 5000 LB APPLIED LOAD
- IMPOSED CONDITIONS

TEST SHEET 159 RESULTS	I		J		K		L	
VERTICAL LOADING:								
APPLIED LOAD	5000	lb	5000	lb	5000	lb	5000	lb
+ PISTON LOAD	841	lb	797	lb	746	lb	715	lb
= TOTAL LOAD	5841	lb	5797	lb	5746	lb	5715	lb
WATER TEMPERATURE	27.3	C	27.4	C	27.4	C	27.8	C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER	1.35	32.0	1.40	30.8	1.39	29.0	1.39	27.8
FORWARD RECESSES STBD INNER AND OUTER	1.54	32.7	1.60	31.0	1.59	29.0	1.61	27.6
AFTER RECESSES PORT OUTER AND INNER	1.45	30.5	1.50	28.6	1.49	27.8	1.50	27.0
AFTER RECESSES STBD INNER AND OUTER	1.31	24.5	1.30	22.5	1.33	21.4	1.33	20.7
Summed Flow, Av.Press.	5.65	29.9	5.80	28.2	5.80	26.8	5.83	25.8
FLOW BY GEMST	6.00		6.13		6.19		6.20	
MANIFOLD PRESSURE		88.0		87.7		87.0		86.4
PISTON PRESSURE sensor		131.6		125.4		117.5		112.2
gauge		133		126		118		113
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER	0.56	129.0	0.56	122.7	0.56	115.0	0.56	109.6
PORT INNER	0.82		0.78		0.75		0.73	
CENTRE	0.47	128.8	0.46	121.9	0.46	114.0	0.46	108.5
STBD INNER	0.67		0.65		0.65		0.64	
STBD OUTER	2.37	125.0	2.23	119.4	2.09	111.8	2.00	106.7
Summed Flow, Av.Press.	4.89	127.6	4.68	121.3	4.51	113.6	4.39	108.3
FLOW BY GEMST	4.22		4.03		3.93		3.87	
MANIFOLD PRESSURE		135.8		129.3		120.9		114.9
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	10.22		10.16		10.12		10.07	
FLOAT OF SHAFT IN BOTTOM HALF BEARING								
FORWARD DIAL GAUGE	.00038	in	.00029	in	.00024	in	.00020	in
AFTER DIAL GAUGE	.00044	in	.00023	in	.00017	in	.00014	in
Float at Centre	.00041	in	.00026	in	.000205	in	.00017	in

TABLE 20.5A CONTINUATION TABLE 20.5A

DECREASING MANIFOLD PRESSURES UNDER 5000 LB APPLIED LOAD

IMPOSED CONDITIONS

TEST SHEET 159 RESULTS	M	N		
VERTICAL LOADING:				
APPLIED LOAD	5000 lb	5000 lb	lb	lb
+ PISTON LOAD	620 lb	569 lb	lb	lb
= TOTAL LOAD	5620 lb	5569 lb	lb	lb
WATER TEMPERATURE	27.4 C	27.8 C	C	C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00			

PRESSURES AND FLOW RATES

TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	1.39	24.9	1.37	23.0				
	STBD INNER AND OUTER	1.60	24.2	1.58	22.0				
AFTER RECESSES	PORT OUTER AND INNER	1.49	25.6	1.47	24.7				
	STBD INNER AND OUTER	1.30	19.0	1.30	18.3				
Summed Flow, Av.Press.		5.78	23.4	5.72	22.0				
FLOW BY GEMST		6.16		6.14					
MANIFOLD PRESSURE			83.6		80.9				
PISTON PRESSURE	sensor		99.8		92.0				
	gauge		98		90				

BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	0.56	96.0	0.56	88.5				
	PORT INNER	0.70		0.67					
	CENTRE	0.46	95.0	0.46	87.8				
	STBD INNER	0.64		0.64					
	STBD OUTER	1.81	94.0	1.71	86.7				
Summed Flow, Av.Press.		4.17	95.0	4.04	87.7				
FLOW BY GEMST		3.81		3.77					
MANIFOLD PRESSURE			102.9		94.5				

TOTAL FLOW TO BEARING

BY GEMST TOTALISER	9.97	9.51		

FLOAT OF SHAFT IN BOTTOM HALF BEARING

FORWARD DIAL GAUGE	.00012 in	.00008 in	in	in
AFTER DIAL GAUGE	.00008 in	.00008 in	in	in
Float at Centre	.00010 in	.00008 in	in	in

TABLE 20.5B

TABLE 20.5B

INCREASING MANIFOLD PRESSURES UNDER 5000 LB APPLIED LOAD
IMPOSED CONDITIONS

TEST SHEET 159 RESULTS	A		B		C		D	
VERTICAL LOADING:								
APPLIED LOAD	5000	lb	5000	lb	5000	lb	5000	lb
+ PISTON LOAD	581	lb	657	lb	727	lb	777	lb
= TOTAL LOAD	5581	lb	5657	lb	5727	lb	5777	lb
WATER TEMPERATURE	26.9	C	27.1	C	27.0	C	27.2	C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER	1.36	23.2	1.40	26.0	1.42	28.3	1.43	30.4
FORWARD RECESSES STBD INNER AND OUTER	1.57	21.3	1.61	24.9	1.63	27.8	1.63	30.5
AFTER RECESSES PORT OUTER AND INNER	1.52	21.9	1.58	23.8	1.57	26.0	1.56	28.3
AFTER RECESSES STBD INNER AND OUTER	1.31	17.4	1.35	18.8	1.36	20.5	1.40	22.4
Summed Flow, Av.Press.	5.76	21.0	5.94	23.4	5.98	25.6	6.02	27.9
FLOW BY GEMST	6.16		6.33		6.35		6.39	
MANIFOLD PRESSURE		81.6		87.0		89.7		91.1
PISTON PRESSURE sensor		92.3		104.7		114.6		123.0
gauge		92		104		115		123
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER	0.56	88.7	0.56	101.4	0.56	111.6	0.56	121.0
PORT INNER	0.65		0.67		0.70		0.73	
CENTRE	0.46	88.2	0.46	100.7	0.46	110.6	0.46	120.0
STBD INNER	0.46		0.48		0.48		0.63	
STBD OUTER	1.61	87.5	1.75	99.5	1.88	109.0	2.03	118.0
Summed Flow, Av.Press.	3.74	88.2	3.92	100.5	4.08	110.4	4.41	119.0
FLOW BY GEMST	3.75		3.77		3.84		3.92	
MANIFOLD PRESSURE		94.8		107.4		117.5		126.8
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	9.91		10.10		10.19		10.31	
FLOAT OF SHAFT IN BOTTOM HALF BEARING								
FORWARD DIAL GAUGE	.00008	in	.00010	in	.00013	in	.00020	in
AFTER DIAL GAUGE	.00010	in	.00010	in	.00011	in	.00015	in
Float at Centre	.00009	in	.00010	in	.00012	in	.000175	in

TABLE 20.5B CONTINUATION TABLE 20.5B

INCREASING MANIFOLD PRESSURES UNDER 5000 LB APPLIED LOAD
IMPOSED CONDITIONS

TEST SHEET 159 RESULTS	E		F		G		H	
VERTICAL LOADING:								
APPLIED LOAD	5000	lb	5000	lb	5000	lb	5000	lb
+ PISTON LOAD	841	lb	898	lb	916	lb	929	lb
= TOTAL LOAD	5841	lb	5898	lb	5916	lb	5929	lb
WATER TEMPERATURE	27.0	C	26.8	C	27.2	C	27.2	C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER	1.44	32.5	1.41	34.8	1.40	35.8	1.40	36.3
FORWARD RECESSES STBD INNER AND OUTER	1.61	32.8	1.59	35.4	1.58	36.4	1.58	37.0
AFTER RECESSES PORT OUTER AND INNER	1.54	30.6	1.50	34.7	1.48	36.6	1.46	38.0
AFTER RECESSES STBD INNER AND OUTER	1.38	24.6	1.32	30.0	1.28	33.7	1.25	36.0
Summed Flow, Av.Press.	5.97	30.1	5.82	33.7	5.74	35.6	5.69	36.8
FLOW BY GEMST	6.35		6.23		6.13		6.09	
MANIFOLD PRESSURE		92.6		94.0		94.5		94.9
PISTON PRESSURE sensor		132.1		141.1		144.6		146.9
gauge		133		142		145		147
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER	0.56	130.0	0.58	139.0	0.60	142.0	0.62	144.6
PORT INNER	0.76		0.83		0.90		0.94	
CENTRE	0.47	129.0	0.48	138.0	0.49	142.0	0.50	143.8
STBD INNER	0.63		0.66		0.69		0.71	
STBD OUTER	2.19	127.0	2.41	135.0	2.57	138.0	2.65	139.5
Summed Flow, Av.Press.	4.61	128.6	4.96	137.7	5.25	140.7	5.42	142.6
FLOW BY GEMST	3.99		4.30		4.60		4.81	
MANIFOLD PRESSURE		136.5		145.6		149.0		151.0
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	10.34		10.53		10.73		10.90	
FLOAT OF SHAFT IN BOTTOM HALF BEARING								
FORWARD DIAL GAUGE	.00027 in		.00050 in		.00069 in		.00083 in	
AFTER DIAL GAUGE	.00022 in		.00050 in		.00069 in		.00082 in	
Float at Centre	.000245in		.00050 in		.00069 in		.000825in	

TABLE 20.5B CONTINUATION TABLE 20.5B

INCREASING MANIFOLD PRESSURES UNDER 5000 LB APPLIED LOAD

IMPOSED CONDITIONS

TEST SHEET 159 RESULTS	I		J		K		L	
VERTICAL LOADING:								
APPLIED LOAD	5000	lb	5000	lb	5000	lb	5000	lb
+ PISTON LOAD	942	lb	954	lb	973	lb	983	lb
= TOTAL LOAD	5942	lb	5954	lb	5973	lb	5983	lb
WATER TEMPERATURE	26.5	C	26.7	C	27.1	C	26.5	C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER	1.40	36.9	1.39	37.4	1.39	38.0	1.38	39.7
FORWARD RECESSES STBD INNER AND OUTER	1.57	37.6	1.57	38.0	1.56	38.9	1.56	40.5
AFTER RECESSES PORT OUTER AND INNER	1.44	39.9	1.44	40.0	1.43	40.6	1.43	41.7
AFTER RECESSES STBD INNER AND OUTER	1.21	40.7	1.15	43.0	1.12	47.6	1.11	49.0
Summed Flow, Av.Press.	5.62	38.7	5.55	39.6	5.50	41.3	5.48	41.9
FLOW BY GEMST	6.01		5.96		5.90		5.87	
MANIFOLD PRESSURE		95.2		95.0		95.6		95.8
PISTON PRESSURE sensor		148.9		149.3		152.0		153.0
gauge		149		151		154		155.5
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER	0.70	146.0	0.79	147.0	0.98	149.9	1.06	151.0
PORT INNER	1.01		1.05		1.12		1.15	
CENTRE	0.55	145.0	0.59	146.0	0.72	149.0	0.82	150.0
STBD INNER	0.78		0.91		1.33		1.33	
STBD OUTER	2.82	140.0	2.93	142.0	3.14	143.0	3.22	144.0
Summed Flow, Av.Press.	5.81	146.7	6.27	145.0	7.18	147.3	7.58	148.3
FLOW BY GEMST	5.37		5.79		6.81		7.33	
MANIFOLD PRESSURE		153.0		154.6		157.7		158.9
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	11.38		11.75		12.71		13.20	
FLOAT OF SHAFT IN BOTTOM HALF BEARING								
FORWARD DIAL GAUGE	.00108	in	.00130	in	.00151	in	.00162	in
AFTER DIAL GAUGE	.00104	in	.00126	in	.00149	in	.00158	in
Float at Centre	.00106	in	.00128	in	.00150	in	.00160	in

TABLE 20.5B CONTINUATION TABLE 20.5B

INCREASING MANIFOLD PRESSURES UNDER 5000 LB APPLIED LOAD

IMPOSED CONDITIONS

TEST SHEET 159 RESULTS	M	N	O	P
VERTICAL LOADING:				
APPLIED LOAD	5000 lb	5000 lb	5000 lb	lb
+ PISTON LOAD	992 lb	1011 lb	1033 lb	lb
= TOTAL LOAD	5992 lb	6011 lb	6033 lb	lb
WATER TEMPERATURE	26.5 C	26.3 C	27.0 C	C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00			

PRESSURES AND FLOW RATES

TOP HALF BEARING		M igpm	M psig	N igpm	N psig	O igpm	O psig	P igpm	P psig
FORWARD RECESSES	PORT OUTER AND INNER	1.37	39.0	1.37	39.7	1.35	40.7		
	STBD INNER AND OUTER	1.55	39.9	1.54	40.5	1.53	40.5		
AFTER RECESSES	PORT OUTER AND INNER	1.43	41.0	1.42	41.7	1.42	41.8		
	STBD INNER AND OUTER	1.08	51.0	1.05	53.0	1.03	55.0		
Summed Flow, Av.Press.		5.43	42.7	5.33	43.7	5.33	44.8		
FLOW BY GEMST		5.83		5.81		5.74			
MANIFOLD PRESSURE			95.8		96.0		96.0		
PISTON PRESSURE	sensor		155.5		158.6		161.8		
	gauge		157		160		163.5		

BOTTOM HALF BEARING		M igpm	M psig	N igpm	N psig	O igpm	O psig	P igpm	P psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	1.20	152.0	1.39	154.0	1.69	156.9		
	PORT INNER	1.20		1.26		1.35			
	CENTRE	0.99	151.5	1.18	153.0	1.48	155.0		
	STBD INNER	1.43		1.78		2.06			
	STBD OUTER	3.36	144.5	3.57	145.8	3.83	147.0		
Summed Flow, Av.Press.		8.18	149.3	9.18	150.9	10.41	152.9		
FLOW BY GEMST		8.07		8.94		10.24			
MANIFOLD PRESSURE			160.8		162.6		166.0		

TOTAL FLOW TO BEARING

	M	N	O	P
BY GEMST TOTALISER	13.90	14.75	15.98	

FLOAT OF SHAFT IN BOTTOM HALF BEARING

	M	N	O	P
FORWARD DIAL GAUGE	.00178 in	.00200 in	.00232?in	in
AFTER DIAL GAUGE	.00178 in	.00196 in	.00218 in	in
Float at Centre	.00178 in	.00198 in	.00227 in	in

TABLE 20.6A TABLE 20.6A

DECREASING MANIFOLD PRESSURES UNDER 6000 LB APPLIED LOAD
IMPOSED CONDITIONS

TEST SHEET 160 RESULTS		A		B		C		D	
VERTICAL LOADING:									
	APPLIED LOAD	6000	lb	6000	lb	6000	lb	6000	lb
	+ PISTON LOAD	1113	lb	1094	lb	1075	lb	1062	lb
	= TOTAL LOAD	7113	lb	7094	lb	7075	lb	7062	lb
WATER TEMPERATURE		28.8	C	28.8	C	28.5	C	29.2	C
OTHER CONDITIONS		Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	1.29	43.0	1.28	42.6	1.26	41.7	1.24	40.9
	STBD INNER AND OUTER	1.46	44.7	1.45	43.9	1.42	43.0	1.41	42.4
AFTER RECESSES	PORT OUTER AND INNER	1.34	44.9	1.33	43.0	1.32	41.0	1.32	39.8
	STBD INNER AND OUTER	1.09	47.6	1.09	44.7	1.11	41.7	1.12	38.6
Summed Flow, Av.Press.		5.18	45.1	5.15	43.5	5.11	41.9	5.09	40.4
FLOW BY GEMST		5.70		5.66		5.64		5.65	
MANIFOLD PRESSURE			95.7		93.9		92.0		89.9
PISTON PRESSURE	sensor		174.0		171.6		169.0		166.0
	gauge		176		173		170		168
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	1.58	168.0	1.44	166.0	1.32	164.0	1.19	161.0
	PORT INNER	1.56		1.52		1.47		1.42	
	CENTRE	1.28	168.9	1.17	166.9	1.06	165.0	0.92	162.0
	STBD INNER	1.94		1.80		1.66		1.49	
	STBD OUTER	3.95	159.8	3.84	157.8	3.72	156.7	3.58	155.0
Summed Flow, Av.Press.		10.31	165.6	9.77	163.6	9.23	161.9	8.60	159.3
FLOW BY GEMST		10.06		9.66		9.06		8.42	
MANIFOLD PRESSURE			179.0		178.8		174.7		172.7
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		15.76		15.32		14.70		14.07	
FLOAT OF SHAFT IN BOTTOM HALF BEARING									
FORWARD DIAL GAUGE		.00202	in	.00188	in	.00171	in	.00158	in
AFTER DIAL GAUGE		.00202	in	.00197	in	.00188	in	.00178	in
Float at Centre		.00202	in	.001925	in	.001795	in	.00168	in

DECREASING MANIFOLD PRESSURES UNDER 6000 LB APPLIED LOAD
- IMPOSED CONDITIONS

TEST SHEET 160 RESULTS		E		F		G		H	
VERTICAL LOADING:									
	APPLIED LOAD	6000	lb	6000	lb	6000	lb	6000	lb
	+ PISTON LOAD	1043	lb	1012	lb	987	lb	974	lb
	= TOTAL LOAD	7043	lb	7012	lb	6987	lb	6974	lb
WATER TEMPERATURE		29.3	C	29.3	C	29.2	C	29.0	C
OTHER CONDITIONS		Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
	PORT OUTER	1.23	40.0	1.25	38.9	1.27	37.8	1.29	37.3
FORWARD	AND INNER								
RECESSES	STBD INNER	1.40	41.7	1.42	40.0	1.45	39.0	1.46	38.5
	AND OUTER								
	PORT OUTER	1.32	38.9	1.32	37.5	1.35	36.4	1.38	35.9
AFTER	AND INNER								
RECESSES	STBD INNER	1.13	36.4	1.18	32.4	1.23	30.5	1.24	29.5
	AND OUTER								
Summed Flow, Av.Press.		5.08	52.3	5.17	37.2	5.30	35.9	5.37	35.3
FLOW BY GEMST		5.62		5.70		5.79		5.84	
MANIFOLD PRESSURE			88.6		88.8		88.9		89.0
PISTON PRESSURE	sensor		164.0		159.6		155.8		153.0
	gauge		165		160		156		154
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
	PORT OUTER	1.09	159.4	0.85	156.0	0.67	152.0	0.62	150.8
FWD/AFT	PORT INNER	1.37		1.24		1.10		1.02	
PAIRS OF	CENTRE	0.79	160.8	0.61	156.0	0.53	152.0	0.50	150.6
RECESSES	STBD INNER	1.35		0.98		0.76		0.72	
	STBD OUTER	3.46	153.4	3.18	150.0	2.94	147.0	2.82	145.7
Summed Flow, Av.Press.		8.06	157.9	7.46	154.0	6.00	150.0	5.68	149.0
FLOW BY GEMST		7.82		6.38		5.44		5.01	
MANIFOLD PRESSURE			170.6		165.2		160.0		157.0
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		13.44		12.08		11.23		10.85	
FLOAT OF SHAFT IN BOTTOM HALF BEARING									
FORWARD DIAL GAUGE		.00142	in	.00112	in	.00080	in	.00062	in
AFTER DIAL GAUGE		.00162	in	.00132	in	.00100	in	.00078	in
Float at Centre		.00152	in	.00122	in	.00090	in	.00070	in

TABLE 20.6A CONTINUATION TABLE 20.6A

DECREASING MANIFOLD PRESSURES UNDER 6000 LB APPLIED LOAD

IMPOSED CONDITIONS

TEST SHEET 160 RESULTS		I		J		K		L	
VERTICAL LOADING:									
	APPLIED LOAD	6000	lb	6000	lb	6000	lb	6000	lb
	+ PISTON LOAD	901	lb	860	lb	822	lb	727	lb
	= TOTAL LOAD	6901	lb	6860	lb	6822	lb	6727	lb
WATER TEMPERATURE		29.3	C	29.1	C	28.9	C	28.6	C
OTHER CONDITIONS		Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	1.32	34.5	1.34	32.9	1.37	31.7	1.40	28.2
	STBD INNER AND OUTER	1.50	35.0	1.53	33.5	1.55	32.0	1.62	28.1
AFTER RECESSES	PORT OUTER AND INNER	1.42	32.6	1.43	31.8	1.44	31.0	1.45	29.8
	STBD INNER AND OUTER	1.29	25.4	1.30	24.5	1.30	24.0	1.31	22.6
Summed Flow, Av.Press.		5.53	31.9	5.60	30.7	5.66	29.7	5.78	27.2
FLOW BY GEMST		5.99		6.01		6.09		6.24	
MANIFOLD PRESSURE			88.0		88.0		88.0		87.3
PISTON PRESSURE	sensor		141.8		135.7		129.9		114.7
	gauge		142.5		136		130		115
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	0.58	140.0	0.58	133.9	0.58	127.9	0.58	111.0
	PORT INNER	0.86		0.83		0.82		0.76	
	CENTRE	0.47	139.0	0.47	132.0	0.47	127.0	0.47	111.0
	STBD INNER	0.66		0.65		0.65		0.65	
	STBD OUTER	2.48	135.0	2.36	130.0	2.26	124.8	2.01	109.0
Summed Flow, Av.Press.		5.05	138.0	4.89	132.0	4.78	126.6	4.47	110.3
FLOW BY GEMST		4.31		4.20		4.11		3.95	
MANIFOLD PRESSURE			145.0		139.1		133.9		117.8
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		10.30		10.21		10.20		10.19	
FLOAT OF SHAFT IN BOTTOM HALF BEARING									
FORWARD DIAL GAUGE		.00032	in	.00027	in	.00022	in	.00012	in
AFTER DIAL GAUGE		.00030	in	.00027	in	.00027	in	.00022	in
Float at Centre		.00031	in	.00027	in	.000245	in	.00017	in

TABLE 20.6A CONTINUATION TABLE 20.6A

DECREASING MANIFOLD PRESSURES UNDER 6000 LB APPLIED LOAD
- IMPOSED CONDITIONS

TEST SHEET 160 RESULTS	M		N					
VERTICAL LOADING:								
APPLIED LOAD	6000	lb	6000	lb		lb		lb
+ PISTON LOAD	651	lb	613	lb		lb		lb
= TOTAL LOAD	6651	lb	6613	lb		lb		lb
WATER TEMPERATURE	28.9	C	28.0	C		C		C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER	1.40	25.8	1.39	24.4				
FORWARD RECESSES STBD INNER AND OUTER	1.62	25.4	1.61	23.6				
AFTER RECESSES PORT OUTER AND INNER	1.45	28.7	1.45	27.5				
AFTER RECESSES STBD INNER AND OUTER	1.29	21.6	1.28	20.9				
Summed Flow, Av.Press.	5.76	25.4	5.73	24.1				
FLOW BY GEMST	6.21		6.18					
MANIFOLD PRESSURE		85.0		83.4				
PISTON PRESSURE sensor		104.5		98.0				
gauge		103		97				
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER	0.58	100.9	0.57	94.6				
PORT INNER	0.72		0.69					
CENTRE	0.47	100.0	0.47	93.8				
STBD INNER	0.65		0.65					
STBD OUTER	1.87	99.4	1.78	92.7				
Summed Flow, Av.Press.	4.29	100.1	4.16	93.7				
FLOW BY GEMST	3.89		3.85					
MANIFOLD PRESSURE		107.9		101.2				
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	10.10		10.03					
FLOAT OF SHAFT IN BOTTOM HALF BEARING								
FORWARD DIAL GAUGE	.00008	in	.00002	in		in		in
AFTER DIAL GAUGE	.00014	in	.00012	in		in		in
Float at Centre	.00011	in	.00007	in		in		in

TABLE 20.6B

TABLE 20.6B

INCREASING MANIFOLD PRESSURES UNDER 6000 LB APPLIED LOAD
IMPOSED CONDITIONS

TEST SHEET 160 RESULTS	A		B		C		D	
VERTICAL LOADING:								
APPLIED LOAD	6000	lb	6000	lb	6000	lb	6000	lb
+ PISTON LOAD	613	lb	676	lb	758	lb	916	lb
= TOTAL LOAD	6613	lb	6676	lb	6758	lb	6916	lb
WATER TEMPERATURE	28.6	C	28.2	C	28.4	C	28.4	C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
PORT OUTER	1.38	24.3	1.40	26.6	1.40	29.4	1.40	34.9
FORWARD AND INNER								
RECESSES STBD INNER	1.61	23.5	1.65	26.2	1.60	29.5	1.60	36.0
AND OUTER								
PORT OUTER	1.45	27.6	1.50	29.1	1.50	30.5	1.50	34.0
AFTER AND INNER								
RECESSES STBD INNER	1.30	20.9	1.34	22.4	1.35	23.7	1.40	26.8
AND OUTER								
Summed Flow, Av.Press.	5.74	96.3	5.90	26.1	5.85	28.3	5.90	32.9
FLOW BY GEMST	6.18		6.37		6.39		6.27	
MANIFOLD PRESSURE		83.3		87.9		90.7		94.6
PISTON PRESSURE sensor		98.0		108.0		119.9		144.0
gauge		97		107		120		145
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
PORT OUTER	0.58	94.4	0.57	104.9	0.57	117.0	0.57	142.3
FWD/AFT PORT INNER	0.69		0.74		0.77		0.84	
PAIRS OF CENTRE	0.47	93.4	0.47	103.6	0.47	115.9	0.47	141.0
RECESSES STBD INNER	0.64		0.64		0.64		0.66	
STBD OUTER	1.78	92.8	1.88	102.8	2.02	114.3	2.39	139.3
Summed Flow, Av.Press.	4.16	93.5	4.30	103.8	4.47	115.7	4.93	140.7
FLOW BY GEMST	3.84		3.89		3.96		4.21	
MANIFOLD PRESSURE		100.3		110.5		123.2		147.8
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	10.02		10.26		10.35		10.48	
FLOAT OF SHAFT IN BOTTOM HALF BEARING								
FORWARD DIAL GAUGE	.00002 in		.00007 in		.00012 in		.00027 in	
AFTER DIAL GAUGE	.00012 in		.00014 in		.00017 in		.00024 in	
Float at Centre	.00007 in		.000105in		.000145in		.000255in	

TABLE 20.6B CONTINUATION TABLE 20.6B

INCREASING MANIFOLD PRESSURES UNDER 6000 LB APPLIED LOAD

IMPOSED CONDITIONS

TEST SHEET 160 RESULTS	E		F		G		H	
VERTICAL LOADING:								
APPLIED LOAD	6000	lb	6000	lb	6000	lb	6000	lb
+ PISTON LOAD	961	lb	980	lb	1011	lb	1037	lb
= TOTAL LOAD	6961	lb	6980	lb	7011	lb	7037	lb
WATER TEMPERATURE	28.1	C	28.3	C	28.9	C	29.0	C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER	1.40	36.6	1.39	37.2	1.38	38.7	1.37	39.4
FORWARD RECESSES STBD INNER AND OUTER	1.58	38.0	1.59	38.6	1.56	40.2	1.55	40.8
AFTER RECESSES PORT OUTER AND INNER	1.49	36.0	1.47	37.0	1.44	39.6	1.41	41.2
AFTER RECESSES STBD INNER AND OUTER	1.36	28.0	1.33	30.2	1.29	34.0	1.24	36.9
Summed Flow, Av.Press.	5.83	34.6	5.78	35.8	5.67	38.1	5.57	39.6
FLOW BY GEMST	6.22		6.15		6.07		6.00	
MANIFOLD PRESSURE		95.1		95.5		95.9		95.9
PISTON PRESSURE sensor		151.0		153.0		158.8		161.4
gauge		152		155		160		164
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER	0.57	149.5	0.58	152.0	0.61	157.3	0.63	159.0
PORT INNER	0.87		0.90		0.96		1.02	
CENTRE	0.48	148.6	0.48	150.9	0.49	156.5	0.51	159.0
STBD INNER	0.67		0.68		0.71		0.74	
STBD OUTER	2.52	145.6	2.57	148.0	2.73	152.5	2.85	154.0
Summed Flow, Av.Press.	5.11	147.9	5.21	150.3	5.50	155.4	5.75	157.3
FLOW BY GEMST	4.36		4.43		4.77		5.04	
MANIFOLD PRESSURE		156.4		157.7		163.3		166.9
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	10.58		10.58		10.84		11.04	
FLOAT OF SHAFT IN BOTTOM HALF BEARING								
FORWARD DIAL GAUGE	.00032	in	.00043	in	.00063	in	.00080	in
AFTER DIAL GAUGE	.00034	in	.00041	in	.00057	in	.00068	in
Float at Centre	.00033	in	.00042	in	.00060	in	.00074	in

TABLE 20.6B CONTINUATION TABLE 20.6B

INCREASING MANIFOLD PRESSURES UNDER 6000 LB APPLIED LOAD - IMPOSED CONDITIONS								
TEST SHEET 160 RESULTS	I		J		K		L	
VERTICAL LOADING:								
APPLIED LOAD	6000	lb	6000	lb	6000	lb	6000	lb
+ PISTON LOAD	1049	lb	1062	lb	1090	lb	1106	lb
= TOTAL LOAD	7049	lb	7062	lb	7090	lb	7106	lb
WATER TEMPERATURE	28.8	C	28.9	C	28.3	C	28.7	C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER	1.35	40.0	1.35	40.6	1.33	41.9	1.32	42.8
FORWARD RECESSES STBD INNER AND OUTER	1.53	41.8	1.53	42.3	1.50	43.7	1.50	44.6
AFTER RECESSES PORT OUTER AND INNER	1.38	43.8	1.38	44.1	1.36	45.0	1.36	45.3
AFTER RECESSES STBD INNER AND OUTER	1.17	42.8	1.15	44.7	1.08	51.2	1.04	55.0
Summed Flow, Av.Press.	5.43	42.1	5.41	42.8	5.27	45.4	5.22	46.9
FLOW BY GEMST	5.90		5.90		5.79		5.71	
MANIFOLD PRESSURE		96.0		96.0		96.5		97.2
PISTON PRESSURE sensor		164.0		165.0		169.6		173.8
gauge		166		168		172.5		175
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER	0.74	162.5	0.81	162.7	1.10	166.5	1.33	169.2
PORT INNER	1.13		1.17		1.30		1.39	
CENTRE	0.56	162.3	0.59	163.1	0.84	166.9	1.09	168.5
STBD INNER	0.87		0.95		1.40		1.71	
STBD OUTER	3.08	156.9	3.17	156.9	3.54	159.4	3.78	161.2
Summed Flow, Av.Press.	6.38	160.6	6.69	161.2	8.18	164.4	9.30	166.3
FLOW BY GEMST	5.80		6.17		7.88		9.06	
MANIFOLD PRESSURE		171.9		171.8		177.2		177.8
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	11.70		12.07		13.67		14.77	
FLOAT OF SHAFT IN BOTTOM HALF BEARING								
FORWARD DIAL GAUGE	.00110	in	.00120	in	.00158	in	.00180	in
AFTER DIAL GAUGE	.00097	in	.00108	in	.00148	in	.00170	in
Float at Centre	.00103	in	.00114	in	.00153	in	.00175	in

TABLE 20.6B CONTINUATION TABLE 20.6B

INCREASING MANIFOLD PRESSURES UNDER 6000 LB APPLIED LOAD - IMPOSED CONDITIONS

TEST SHEET 160 RESULTS	M			
VERTICAL LOADING:				
APPLIED LOAD	6000 lb	lb	lb	lb
+ PISTON LOAD	1138 lb	lb	lb	lb
= TOTAL LOAD	7138 lb	lb	lb	lb
WATER TEMPERATURE	28.0 C	C	C	C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00			

PRESSURES AND FLOW RATES

TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	1.29	44.2						
	STBD INNER AND OUTER	1.48	45.8						
AFTER RECESSES	PORT OUTER AND INNER	1.33	46.4						
	STBD INNER AND OUTER	0.98	57.6						
Summed Flow, Av.Press.		5.08	48.5						
FLOW BY GEMST		5.61							
MANIFOLD PRESSURE			96.4						
PISTON PRESSURE	sensor		178.3						
	gauge		180						

BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	1.71	172.5						
	PORT INNER	1.51							
	CENTRE	1.44	172.0						
	STBD INNER	1.93							
	STBD OUTER	4.12	162.0						
Summed Flow, Av.Press.		10.71	168.8						
FLOW BY GEMST		10.74							
MANIFOLD PRESSURE			182.2						

TOTAL FLOW TO BEARING

BY GEMST TOTALISER	16.35			

FLOAT OF SHAFT IN BOTTOM HALF BEARING

FORWARD DIAL GAUGE	.00218 in	in	in	in
AFTER DIAL GAUGE	.00200 in	in	in	in
Float at Centre	.00209 in	in	in	in

TABLE 20.7A TABLE 20.7A

DECREASING MANIFOLD PRESSURES UNDER 7000 LB APPLIED LOAD
IMPOSED CONDITIONS

TEST SHEET 161 RESULTS		A		B		C		D	
VERTICAL LOADING:									
	APPLIED LOAD	7000	lb	7000	lb	7000	lb	7000	lb
	+ PISTON LOAD	1195	lb	1170	lb	1113	lb	1094	lb
	= TOTAL LOAD	8195	lb	8170	lb	8113	lb	8094	lb
WATER TEMPERATURE		26.1	C	25.5	C	26.3	C	26.3	C
OTHER CONDITIONS		Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	0.99	45.0	0.97	43.8	0.97	43.1	0.98	42.5
	STBD INNER AND OUTER	1.36	47.7	1.33	46.3	1.32	45.6	1.34	44.9
AFTER RECESSES	PORT OUTER AND INNER	1.25	47.0	1.25	43.9	1.24	43.1	1.27	42.4
	STBD INNER AND OUTER	0.91	57.3	0.94	51.8	0.95	48.9	1.00	46.7
Summed Flow, Av.Press.		4.51	49.3	4.49	46.5	4.48	45.2	4.59	44.1
FLOW BY GEMST		5.18		5.12		5.14		5.21	
MANIFOLD PRESSURE			93.3		90.0		89.0		89.4
PISTON PRESSURE sensor			186.0		182.2		179.0		175.0
	gauge		189		185		176		173
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	1.45	182.9	1.26	179.1	1.14	176.4	1.02	173.7
	PORT INNER	1.36		1.30		1.25		1.20	
	CENTRE	1.22	181.9	1.04	178.7	0.90	175.9	0.75	173.6
	STBD INNER	1.57		1.55		1.40		1.23	
	STBD OUTER	3.78	174.1	3.61	170.5	3.48	169.0	3.34	167.0
Summed Flow, Av.Press.		9.38	179.6	8.76	176.1	8.17	173.8	7.54	171.4
FLOW BY GEMST		9.41		8.61		7.99		7.27	
MANIFOLD PRESSURE			192.8		185.5		186.2		183.7
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		14.59		13.73		12.27		12.48	
FLOAT OF SHAFT IN BOTTOM HALF BEARING									
FORWARD DIAL GAUGE		.00224	in	.00202	in	.00188	in	.00173	in
AFTER DIAL GAUGE		.00192	in	.00180	in	.00172	in	.00157	in
Float at Centre		.00208	in	.00191	in	.00180	in	.00165	in

TABLE 20.7A CONTINUATION TABLE 20.7A

DECREASING MANIFOLD PRESSURES UNDER 7000 LB APPLIED LOAD
IMPOSED CONDITIONS

TEST SHEET 161 RESULTS	E		F		G		H	
VERTICAL LOADING:								
APPLIED LOAD	7000	lb	7000	lb	7000	lb	7000	lb
+ PISTON LOAD	1103	lb	1094	lb	1081	lb	1062	lb
= TOTAL LOAD	8103	lb	8094	lb	8081	lb	8062	lb
WATER TEMPERATURE	25.7	C	26.3	C	25.7	C	25.6	C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER	0.98	41.7	0.99	41.1	1.00	40.3	1.01	39.7
FORWARD RECESSES STBD INNER AND OUTER	1.35	44.1	1.36	43.6	1.38	42.9	1.37	42.0
AFTER RECESSES PORT OUTER AND INNER	1.28	41.6	1.29	40.8	1.31	40.2	1.32	39.5
AFTER RECESSES STBD INNER AND OUTER	1.04	44.1	1.07	41.9	1.09	39.3	1.13	37.1
Summed Flow, Av.Press.	4.65	42.9	4.71	41.8	4.78	40.7	4.80	39.6
FLOW BY GEMST	5.25		5.30		5.34		5.41	
MANIFOLD PRESSURE		89.0		89.0		89.3		89.4
PISTON PRESSURE sensor		174.0		171.0		169.0		166.3
gauge		174.5		173		171		168
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER	0.91	171.1	0.81	169.8	0.70	167.3	0.65	165.3
PORT INNER	1.15		1.11		1.05		1.00	
CENTRE	0.66	170.6	0.60	169.7	0.54	166.8	0.52	164.6
STBD INNER	1.07		0.90		0.77		0.73	
STBD OUTER	3.20	164.7	3.09	163.8	2.94	160.9	2.84	159.7
Summed Flow, Av.Press.	6.99	168.8	6.51	167.8	6.00	164.7	5.74	163.2
FLOW BY GEMST	6.62		6.00		5.52		5.16	
MANIFOLD PRESSURE		178.7		176.9		172.3		171.2
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	11.87		11.30		10.86		10.02	
FLOAT OF SHAFT IN BOTTOM HALF BEARING								
FORWARD DIAL GAUGE	.00160 in		.00141 in		.00130 in		.00119 in	
AFTER DIAL GAUGE	.00144 in		.00123 in		.00114 in		.00110 in	
Float at Centre	.00152 in		.00132 in		.00122 in		.001145in	

TABLE 20.7A CONTINUATION TABLE 20.7A

DECREASING MANIFOLD PRESSURES UNDER 7000 LB APPLIED LOAD

IMPOSED CONDITIONS

TEST SHEET 161 RESULTS		I		J		K		L	
VERTICAL LOADING:									
	APPLIED LOAD	7000	lb	7000	lb	7000	lb	7000	lb
	+ PISTON LOAD	1043	lb	1021	lb	999	lb	854	lb
	= TOTAL LOAD	8043	lb	8021	lb	7999	lb	7854	lb
WATER TEMPERATURE		25.6	C	26.3	C	25.9	C	25.5	C
OTHER CONDITIONS		Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	1.02	38.9	1.03	37.8	1.07	35.3	1.11	32.4
	STBD INNER AND OUTER	1.38	41.4	1.42	40.0	1.48	37.4	1.53	33.9
AFTER RECESSES	PORT OUTER AND INNER	1.33	38.7	1.36	37.0	1.41	35.2	1.43	33.9
	STBD INNER AND OUTER	1.17	34.5	1.22	31.3	1.26	28.6	1.28	27.2
Summed Flow, Av.Press.		4.90	38.4	5.03	36.5	5.22	34.1	5.35	31.8
FLOW BY GEMST		5.49		5.58		5.73		5.83	
MANIFOLD PRESSURE			89.0		89.3		89.0		89.0
PISTON PRESSURE sensor			163.8		159.0		148.0		135.0
gauge			165		161.5		158		135.0
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	0.61	162.8	0.57	157.8	0.56	147.0	0.56	133.3
	PORT INNER	0.94		0.86		0.79		0.75	
	CENTRE	0.49	161.5	0.47	157.1	0.46	145.9	0.46	133.0
	STBD INNER	0.69		0.65		0.64		0.64	
	STBD OUTER	2.71	157.3	2.54	153.4	2.31	142.8	2.10	130.0
Summed Flow, Av.Press.		5.44	160.5	5.09	156.1	4.76	145.2	4.51	131.8
FLOW BY GEMST		4.79		4.37		4.09		3.95	
MANIFOLD PRESSURE			167.4		165.3		152.1		138.6
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		9.77		9.48		9.82		9.78	
FLOAT OF SHAFT IN BOTTOM HALF BEARING									
FORWARD DIAL GAUGE		.00101	in	.00073	in	.00058	in	.00050	in
AFTER DIAL GAUGE		.00082	in	.00058	in	.00039	in	.00033	in
Float at Centre		.000915	in	.000655	in	.000485	in	.000415	in

TABLE 20.7A CONTINUATION TABLE 20.7A

DECREASING MANIFOLD PRESSURES UNDER 7000 LB APPLIED LOAD
- IMPOSED CONDITIONS

TEST SHEET 161 RESULTS	M		N		O		P	
VERTICAL LOADING:								
APPLIED LOAD	7000	lb	7000	lb	7000	lb	7000	lb
+ PISTON LOAD	708	lb	557	lb	379	lb	278	lb
= TOTAL LOAD	7708	lb	7557	lb	7379	lb	7278	lb
WATER TEMPERATURE	26.0	C	25.0	C	25.5	C	24.9	C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER	1.15	27.0	1.12	21.9	0.97	15.6	0.80	11.9
FORWARD RECESSES STBD INNER AND OUTER	1.61	27.6	1.57	21.3	1.34	13.5	1.07	8.7
AFTER RECESSES PORT OUTER AND INNER	1.45	31.0	1.45	27.5	1.33	20.3	0.97	15.8
AFTER RECESSES STBD INNER AND OUTER	1.28	24.6	1.23	21.5	0.96	15.5	0.67	11.1
Summed Flow, Av.Press.	5.49	27.5	5.37	23.0	4.60	16.2	3.51	11.9
FLOW BY GEMST	5.96		5.82		5.07		4.44	
MANIFOLD PRESSURE		86.7		79.9		58.0		53.9
PISTON PRESSURE sensor		111.8		89.7		63.4		47.9
gauge		112		88		60		44
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER	0.56	108.7	0.56	85.8	0.56	58.5	0.56	42.5
PORT INNER	0.69		0.60		0.42		0.39	
CENTRE	0.46	108.0	0.46	85.4	0.46	58.3	0.46	42.3
STBD INNER	0.64		0.64		0.64		0.64	
STBD OUTER	1.80	106.7	1.57	84.7	1.36	57.9	1.24	41.9
Summed Flow, Av.Press.	4.15	107.8	3.83	85.3	3.44	58.2	3.29	42.2
FLOW BY GEMST	3.81		3.73		3.66		3.64	
MANIFOLD PRESSURE		114.9		92.2		64.6		48.2
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	9.77		9.55		8.73		8.08	
FLOAT OF SHAFT IN BOTTOM HALF BEARING								
FORWARD DIAL GAUGE	.00037 in		.00028 in		.00022 in		.00022 in	
AFTER DIAL GAUGE	.00028 in		.00024 in		.00022 in		.00022 in	
Float at Centre	.000325in		.00026 in		.00022 in		.00022 in	

INCREASING MANIFOLD PRESSURES UNDER 7000 LB APPLIED LOAD - IMPOSED CONDITIONS

TEST SHEET 161 RESULTS		A		B		C		D	
VERTICAL LOADING:									
	APPLIED LOAD	7000	lb	7000	lb	7000	lb	7000	lb
	+ PISTON LOAD	278	lb	556	lb	777	lb	948	lb
	= TOTAL LOAD	7278	lb	7556	lb	7777	lb	7948	lb
WATER TEMPERATURE		24.1	C	24.8	C	24.9	C	25.3	C
OTHER CONDITIONS		Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	0.98	12.4	1.44	22.9	1.51	30.7	1.48	37.0
	STBD INNER AND OUTER	1.08	8.2	1.58	20.6	1.64	30.2	1.56	37.4
AFTER RECESSES	PORT OUTER AND INNER	1.03	11.2	1.53	20.5	1.56	28.4	1.51	34.9
	STBD INNER AND OUTER	0.72	10.1	1.30	19.3	1.35	24.8	1.34	29.5
Summed Flow, Av.Press.		3.81	10.5	5.85	20.8	6.06	28.5	5.89	34.7
FLOW BY GEMST		4.68		6.22		6.46		6.22	
MANIFOLD PRESSURE			41.5		80.7		90.9		94.0
PISTON PRESSURE	sensor		47.5		90.0		122.7		148.9
	gauge		44		88		123		150
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	0.56	41.9	0.56	86.5	0.56	120.0	0.56	147.0
	PORT INNER	0.37		0.57		0.68		0.76	
	CENTRE	0.46	41.9	0.46	85.9	0.46	119.0	0.46	146.0
	STBD INNER	0.64		0.63		0.63		0.63	
	STBD OUTER	1.21	41.5	1.50	85.4	1.79	118.0	2.11	143.7
Summed Flow, Av.Press.		3.24	41.8	3.72	85.9	4.12	119.0	4.52	145.6
FLOW BY GEMST		3.64		3.70		3.80		3.96	
MANIFOLD PRESSURE			48.0		92.6		126.6		153.0
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		8.32		9.92		10.26		10.18	
FLOAT OF SHAFT IN BOTTOM HALF BEARING									
FORWARD DIAL GAUGE		.00000	in	.00010	in	.00022	in	.00036	in
AFTER DIAL GAUGE		.00000	in	.00001	in	.00008	in	.00012	in
Float at Centre		.00000	in	.000055	in	.00015	in	.00024	in

TABLE 20.7B CONTINUATION TABLE 20.7B

INCREASING MANIFOLD PRESSURES UNDER 7000 LB APPLIED LOAD
- IMPOSED CONDITIONS

TEST SHEET 161 RESULTS		E		F		G		H	
VERTICAL LOADING:									
	APPLIED LOAD	7000	lb	7000	lb	7000	lb	7000	lb
	+ PISTON LOAD	1015	lb	1049	lb	1075	lb	1113	lb
	= TOTAL LOAD	8015	lb	8049	lb	8075	lb	8113	lb
WATER TEMPERATURE		25.8	C	25.5	C	26.3	C	26.0	C
OTHER CONDITIONS		Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	1.44	39.8	1.43	40.9	1.41	42.4	1.39	43.5
	STBD INNER AND OUTER	1.54	40.6	1.53	41.9	1.52	43.7	1.50	44.7
AFTER RECESSES	PORT OUTER AND INNER	1.48	37.5	1.46	38.6	1.44	41.4	1.40	43.4
	STBD INNER AND OUTER	1.33	31.2	1.31	32.7	1.26	36.5	1.23	39.9
Summed Flow, Av.Press.		5.79	37.3	5.73	38.5	5.63	41.0	5.52	42.9
FLOW BY GEMST		6.17		6.12		6.05		5.93	
MANIFOLD PRESSURE			95.8		96.1		96.9		96.9
PISTON PRESSURE	sensor		159.0		169.1		170.8		173.4
	gauge		160.5		166		170		176
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	0.56	158.6	0.56	163.0	0.58	169.0	0.61	173.6
	PORT INNER	0.80		0.83		0.87		0.95	
	CENTRE	0.47	157.5	0.47	162.0	0.48	168.0	0.49	172.6
	STBD INNER	0.65		0.66		0.68		0.71	
	STBD OUTER	2.32	154.7	2.42	159.0	2.55	165.0	2.72	168.0
Summed Flow, Av.Press.		4.80	156.9	4.94	161.3	5.16	167.3	5.48	171.4
FLOW BY GEMST		4.12		4.23		4.46		4.79	
MANIFOLD PRESSURE			164.5		168.0		177.0		179.0
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		10.29		10.35		10.04		10.72	
FLOAT OF SHAFT IN BOTTOM HALF BEARING									
FORWARD DIAL GAUGE		.00050 in		.00067 in		.00091 in		.00103 in	
AFTER DIAL GAUGE		.00012 in		.00013 in		.00030 in		.00038 in	
Float at Centre		.000315in		.00040 in		.000605in		.000705in	

TABLE 20.7B CONTINUATION TABLE 20.7B

INCREASING MANIFOLD PRESSURES UNDER 7000 LB APPLIED LOAD

IMPOSED CONDITIONS

TEST SHEET 161 RESULTS	I	J	K	L
VERTICAL LOADING:				
APPLIED LOAD	7000 lb	7000 lb	7000 lb	7000 lb
+ PISTON LOAD	1131 lb	1144 lb	1150 lb	1163 lb
= TOTAL LOAD	8131 lb	8144 lb	8150 lb	8163 lb
WATER TEMPERATURE	25.8 C	26.3 C	26.8 C	26.8 C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00			

PRESSURES AND FLOW RATES

TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER	1.39	44.0	1.38	44.6	1.38	44.8	1.36	45.4
FORWARD RECESSES STBD INNER AND OUTER	1.49	45.4	1.48	46.0	1.48	46.2	1.47	46.8
AFTER RECESSES PORT OUTER AND INNER	1.38	45.6	1.36	47.0	1.35	47.3	1.34	47.6
AFTER RECESSES STBD INNER AND OUTER	1.16	43.8	1.12	48.0	1.08	50.0	1.05	52.8
Summed Flow, Av.Press.	5.42	44.7	5.34	46.4	5.29	47.1	5.22	48.1
FLOW BY GEMST	5.86		5.78		5.76		5.70	
MANIFOLD PRESSURE		97.0		97.4		97.0		96.9
PISTON PRESSURE sensor		176		178.9		180.0		181.0
gauge		179		181		182		184

BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER	0.65	176.0	0.76	176.9	0.82	177.3	0.94	178.6
PORT INNER	1.01		1.09		1.12		1.17	
CENTRE	0.52	175.6	0.56	176.6	0.60	177.0	0.67	178.7
STBD INNER	0.75		0.88		0.96		1.13	
STBD OUTER	2.86	157.7	3.04	171.0	3.12	171.5	3.27	172.0
Summed Flow, Av.Press.	4.79	169.8	6.33	174.8	6.62	175.3	7.18	176.4
FLOW BY GEMST	5.17		5.79		6.13		6.85	
MANIFOLD PRESSURE		181.8		184.0		185.7		187.7

TOTAL FLOW TO BEARING

	I	J	K	L
BY GEMST TOTALISER	11.03	11.57	11.89	12.55

FLOAT OF SHAFT IN BOTTOM HALF BEARING

	I	J	K	L
FORWARD DIAL GAUGE	.00122 in	.00142 in	.00198 in	.00158 in
AFTER DIAL GAUGE	.00058 in	.00078 in	.00088 in	.00104 in
Float at Centre	.00090 in	.00110 in	.00118 in	.00131 in

TABLE 20.7B CONTINUATION TABLE 20.7B

INCREASING MANIFOLD PRESSURES UNDER 7000 LB APPLIED LOAD
IMPOSED CONDITIONS

TEST SHEET 161 RESULTS		M		N		O		P	
VERTICAL LOADING:									
	APPLIED LOAD	7000	lb	7000	lb	7000	lb	7000	lb
	+ PISTON LOAD	1169	lb	1182	lb	1192	lb	1201	lb
	= TOTAL LOAD	8169	lb	8182	lb	8192	lb	8201	lb
WATER TEMPERATURE		26.3	C	26.5	C	26.9	C	26.8	C
OTHER CONDITIONS		Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	1.36	45.8	1.36	46.4	1.35	46.9	1.34	47.2
	STBD INNER AND OUTER	1.47	47.0	1.46	47.7	1.46	48.0	1.45	48.5
AFTER RECESSES	PORT OUTER AND INNER	0.34	47.8	1.34	48.3	1.33	48.6	1.33	48.6
	STBD INNER AND OUTER	1.04	54.5	1.00	57.0	0.98	58.9	0.96	59.9
Summed Flow, Av.Press.		5.21	48.8	5.16	49.8	5.12	50.6	5.08	51.1
FLOW BY GEMST		5.69		5.66		5.62		5.60	
MANIFOLD PRESSURE			97.6		97.9		98.0		97.8
PISTON PRESSURE	sensor		181.8		184.5		186.0		186.7
	gauge		185		187		188.5		190
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	1.01	180	1.15	181.7	1.28	183.0	1.42	184.2
	PORT INNER	1.20		1.26		1.31		1.36	
	CENTRE	0.73	179.5	0.91	181.0	1.06	182.3	1.19	183.7
	STBD INNER	1.25		1.45		1.59		1.79	
	STBD OUTER	3.36	172.7	3.54	174.0	3.70	174.6	3.84	175.3
Summed Flow, Av.Press.		7.55	177.4	8.31	178.9	8.94	179.9	9.60	181.1
FLOW BY GEMST		7.19		8.10		8.85		9.41	
MANIFOLD PRESSURE			188.5		191.5		193.0		193.8
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		12.88		13.76		14.47		15.01	
FLOAT OF SHAFT IN BOTTOM HALF BEARING									
FORWARD DIAL GAUGE		.00168 in		.00182 in		.00198 in		.00207 in	
AFTER DIAL GAUGE		.00115 in		.00132 in		.00147 in		.00158 in	
Float at Centre		.001415in		.00157 in		.001725in		.001825in	

TABLE 20.7B CONTINUATION TABLE 20.7B

INCREASING MANIFOLD PRESSURES UNDER 7000 LB APPLIED LOAD
- IMPOSED CONDITIONS

TEST SHEET 161 RESULTS	Q							
VERTICAL LOADING:								
APPLIED LOAD	7000	lb		lb		lb		lb
+ PISTON LOAD	1220	lb		lb		lb		lb
= TOTAL LOAD	8220	lb		lb		lb		lb
WATER TEMPERATURE	27.2	C		C		C		C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
PORT OUTER	1.33	47.9						
FORWARD AND INNER								
RECESSES STBD INNER	1.44	49.4						
AND OUTER								
PORT OUTER	1.32	48.9						
AFTER AND INNER								
RECESSES STBD INNER	0.94	61.8						
AND OUTER								
Summed Flow, Av.Press.	5.03	52.0						
FLOW BY GEMST	5.54							
MANIFOLD PRESSURE		97.9						
PISTON PRESSURE sensor		190.0						
gauge		193						
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
PORT OUTER	1.67	186.5						
FWD/AFT PORT INNER	1.43							
PAIRS OF CENTRE	1.43	185.5						
RECESSES STBD INNER	2.05							
STBD OUTER	4.07	176.5						
Summed Flow, Av.Press.	10.65	182.8						
FLOW BY GEMST	10.58							
MANIFOLD PRESSURE		195.0						
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	16.12							
FLOAT OF SHAFT IN BOTTOM HALF BEARING								
FORWARD DIAL GAUGE	.00228	in		in		in		in
AFTER DIAL GAUGE	.00178	in		in		in		in
Float at Centre	.00203	in		in		in		in

TABLE 20.8A

TABLE 20.8A

DECREASING MANIFOLD PRESSURES UNDER 8000 LB APPLIED LOAD

IMPOSED CONDITIONS

TEST SHEET 162 RESULTS		A		B		C		D	
VERTICAL LOADING:									
	APPLIED LOAD	8000	lb	8000	lb	8000	lb	8000	lb
	+ PISTON LOAD	1341	lb	1322	lb	1296	lb	1283	lb
	= TOTAL LOAD	9341	lb	9322	lb	9296	lb	9283	lb
WATER TEMPERATURE		27.9	C	27.6	C	26.7	C	26.8	C
OTHER CONDITIONS		Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	1.03	51.4	1.01	50.3	1.00	49.2	0.99	48.5
	STBD INNER AND OUTER	1.33	54.2	1.31	52.9	1.30	51.8	1.27	51.0
AFTER RECESSES	PORT OUTER AND INNER	1.24	53.6	1.23	51.6	1.23	49.9	1.21	48.9
	STBD INNER AND OUTER	1.20	65.6	1.20	62.3	1.19	59.1	1.19	56.0
Summed Flow, Av.Press.		4.80	56.2	4.75	54.3	4.72	52.5	4.66	51.1
FLOW BY GEMST		5.09		5.08		5.06		5.03	
MANIFOLD PRESSURE			98.9		96.8		95.0		93.0
PISTON PRESSURE	sensor		208.6		206.2		202.0		205.9
	gauge		212		209		205		203
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	1.85	203.3	1.70	200.9	1.56	198.5	1.36	196.4
	PORT INNER	1.65		1.58		1.52		1.46	
	CENTRE	1.56	205.4	1.43	202.8	1.30	199.7	1.13	197.5
	STBD INNER	2.13		2.02		1.92		1.70	
	STBD OUTER	4.58	191.7	4.35	190.4	4.19	188.1	4.01	187.0
Summed Flow, Av.Press.		11.77	200.1	11.14	198.0	10.49	195.4	9.66	193.3
FLOW BY GEMST		11.73		11.06		10.40		9.52	
MANIFOLD PRESSURE			217.3		213.2		210.0		205.9
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		16.82		16.14		15.46		14.55	
FLOAT OF SHAFT IN BOTTOM HALF BEARING									
FORWARD DIAL GAUGE		.00241	in	.00227	in	.00214	in	.00198	in
AFTER DIAL GAUGE		.00174	in	.00166	in	.00158	in	.00149	in
Float at Centre		.002075	in	.001965	in	.00186	in	.001735	in

TABLE 20.8A CONTINUATION TABLE 20.8A

DECREASING MANIFOLD PRESSURES UNDER 8000 LB APPLIED LOAD
IMPOSED CONDITIONS

TEST SHEET 162 RESULTS		E		F		G		H	
VERTICAL LOADING:									
	APPLIED LOAD	8000	lb	8000	lb	8000	lb	8000	lb
	+ PISTON LOAD	1271	lb	1258	lb	1239	lb	1227	lb
	= TOTAL LOAD	9271	lb	9250	lb	9239	lb	9227	lb
WATER TEMPERATURE		27.3	C	26.8	C	26.7	C	27.0	C
OTHER CONDITIONS		Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	0.98	48.0	0.97	47.3	0.96	46.7	0.96	46.0
	STBD INNER AND OUTER	1.27	50.5	1.26	50.1	1.25	49.1	1.24	48.5
AFTER RECESSES	PORT OUTER AND INNER	1.20	48.4	1.20	47.9	1.19	47.0	1.18	46.2
	STBD INNER AND OUTER	1.17	54.4	1.17	53.0	1.16	50.1	1.16	47.3
Summed Flow, Av.Press.		4.62	50.3	4.60	49.6	4.56	48.2	4.54	47.0
FLOW BY GEMST		5.01		5.02		5.00		5.01	
MANIFOLD PRESSURE			91.9		91.0		89.3		88.3
PISTON PRESSURE	sensor		197.2		197.4		193.8		192.3
	gauge		201		199		196		194
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	1.27	194.6	1.20	193.4	1.06	191.1	0.95	188.8
	PORT INNER	1.42		1.40		1.34		1.28	
	CENTRE	1.05	195.8	0.98	194.5	0.80	191.6	0.68	189.9
	STBD INNER	1.60		1.51		1.33		1.17	
	STBD OUTER	3.92	185.4	3.84	184.7	3.68	182.5	3.53	180.9
Summed Flow, Av.Press.		9.26	191.9	8.93	190.9	8.21	188.4	7.61	186.5
FLOW BY GEMST		9.11		8.77		7.96		7.29	
MANIFOLD PRESSURE			203.9		203.2		198.9		198.1
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		14.12		13.79		12.96		12.30	
FLOAT OF SHAFT IN BOTTOM HALF BEARING									
FORWARD DIAL GAUGE		.00188	in	.00182	in	.00165	in	.00152	in
AFTER DIAL GAUGE		.00142	in	.00138	in	.00123	in	.00110	in
Float at Centre		.00165	in	.00160	in	.00144	in	.00131	in

TABLE 20.8A CONTINUATION TABLE 20.8A

DECREASING MANIFOLD PRESSURES UNDER 8000 LB APPLIED LOAD

IMPOSED CONDITIONS

TEST SHEET 162 RESULTS	I	J	K	L
VERTICAL LOADING:				
APPLIED LOAD	8000 lb	8000 lb	8000 lb	8000 lb
+ PISTON LOAD	1214 lb	1189 lb	1157 lb	1138 lb
= TOTAL LOAD	9124 lb	9189 lb	9157 lb	9138 lb
WATER TEMPERATURE	27.1 C	27.5 C	27.4 C	27.3 C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00			

PRESSURES AND FLOW RATES

TOP HALF BEARING		I igpm	I psig	J igpm	J psig	K igpm	K psig	L igpm	L psig
FORWARD RECESSES	PORT OUTER AND INNER	0.96	45.5	0.97	44.5	0.99	43.2	1.00	42.7
	STBD INNER AND OUTER	1.23	47.9	1.24	47.0	1.27	45.7	1.28	45.3
AFTER RECESSES	PORT OUTER AND INNER	1.19	45.5	1.22	44.6	1.24	42.9	1.26	42.4
	STBD INNER AND OUTER	1.16	44.9	1.18	41.7	1.21	37.3	1.24	35.9
Summed Flow, Av.Press.		4.54	45.9	4.61	44.5	4.71	42.3	4.78	41.6
FLOW BY GEMST		5.03		5.12		5.20		5.29	
MANIFOLD PRESSURE			87.9		88.0		87.9		88.0
PISTON PRESSURE	sensor		189.3		185.2		181.0		178.0
	gauge		192		188		183		180

BOTTOM HALF BEARING		I igpm	I psig	J igpm	J psig	K igpm	K psig	L igpm	L psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	0.85	187.3	0.71	184.6	0.60	180.2	0.58	178.2
	PORT INNER	1.23		1.14		1.01		0.96	
	CENTRE	0.61	188.6	0.54	184.9	0.49	180.6	0.47	177.7
	STBD INNER	1.00		0.80		0.70		0.67	
	STBD OUTER	3.39	179.8	3.20	177.7	2.96	173.9	2.84	172.1
Summed Flow, Av.Press.		7.08	185.2	6.39	182.4	5.76	178.2	5.52	176.0
FLOW BY GEMST		6.63		5.80		8.01		4.72	
MANIFOLD PRESSURE			195.9		192.7		185.8		183.7

TOTAL FLOW TO BEARING

	I	J	K	L
BY GEMST TOTALISER	11.66	10.92	10.21	10.01

FLOAT OF SHAFT IN BOTTOM HALF BEARING

	I	J	K	L
FORWARD DIAL GAUGE	.00139 in	.00128 in	.00090 in	.00079 in
AFTER DIAL GAUGE	.00098 in	.00075 in	.00043 in	.00030 in
Float at Centre	.001185in	.001015in	.000665in	.000545in

TABLE 20.8A CONTINUATION TABLE 20.8A

DECREASING MANIFOLD PRESSURES UNDER 8000 LB APPLIED LOAD
IMPOSED CONDITIONS

TEST SHEET 162 RESULTS		M		N		O		P	
VERTICAL LOADING:									
	APPLIED LOAD	8000	lb	8000	lb	8000	lb	8000	lb
	+ PISTON LOAD	1119	lb	1088	lb	1043	lb	961	lb
	= TOTAL LOAD	9119	lb	9088	lb	9043	lb	8961	lb
WATER TEMPERATURE		27.1	C	27.5	C	27.4	C	26.9	C
OTHER CONDITIONS		Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	1.01	42.0	1.03	40.6	1.05	39.0	1.09	36.0
	STBD INNER AND OUTER	1.30	44.4	1.33	42.9	1.37	41.4	1.44	37.8
AFTER RECESSES	PORT OUTER AND INNER	1.28	41.5	1.31	40.0	1.33	39.3	1.36	37.9
	STBD INNER AND OUTER	1.25	34.3	1.27	32.6	1.29	31.6	1.33	30.0
Summed Flow, Av.Press.		4.84	40.5	4.94	39.0	5.04	37.8	5.22	35.4
FLOW BY GEMST		5.33		5.43		5.46		5.61	
MANIFOLD PRESSURE			88.0		88.2		88.4		88.4
PISTON PRESSURE	sensor		175.7		169.4		162.9		150.0
	gauge		177		172		165		152
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	0.56	175.0	0.56	169.0	0.56	162.9	0.56	148.3
	PORT INNER	0.90		0.87		0.84		0.80	
	CENTRE	0.47	174.9	0.46	168.4	0.46	161.2	0.46	147.6
	STBD INNER	0.65		0.64		0.63		0.63	
	STBD OUTER	2.72	169.2	2.61	164.9	2.49	157.8	2.28	145.0
Summed Flow, Av.Press.		5.30	172.9	5.14	167.4	4.98	160.6	4.73	146.9
FLOW BY GEMST		4.47		4.34		4.21		4.03	
MANIFOLD PRESSURE			181.0		175.6		169.1		154.4
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		9.80		9.77		9.67		9.64	
FLOAT OF SHAFT IN BOTTOM HALF BEARING									
FORWARD DIAL GAUGE		.00064	in	.00059	in	.00051	in	.00040	in
AFTER DIAL GAUGE		.00020	in	.00017	in	.00011	in	.00002	in
Float at Centre		.00042	in	.00038	in	.00031	in	.00021	in

TABLE 20.8A CONTINUATION TABLE 20.8A

DECREASING MANIFOLD PRESSURES UNDER 8000 LB APPLIED LOAD
IMPOSED CONDITIONS

TEST SHEET 162 RESULTS	Q	R		
VERTICAL LOADING:				
APPLIED LOAD	8000 lb	8000 lb	lb	lb
+ PISTON LOAD	784 lb	499 lb	lb	lb
= TOTAL LOAD	8784 lb	8499 lb	lb	lb
WATER TEMPERATURE	27.1 C	26.4 C	C	C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00			

PRESSURES AND FLOW RATES

TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	1.18	30.0	1.11	20.2				
	STBD INNER AND OUTER	1.56	30.8	1.53	18.6				
AFTER RECESSES	PORT OUTER AND INNER	1.42	35.3	1.38	25.6				
	STBD INNER AND OUTER	1.39	27.5	1.35	20.7				
Summed Flow, Av.Press.		5.55	30.9	5.37	21.3				
FLOW BY GEMST		5.86		5.67					
MANIFOLD PRESSURE			88.0		74.4				
PISTON PRESSURE	sensor		123.0		81.0				
	gauge		124		79				

BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	0.56	121.0	0.56	76.7				
	PORT INNER	0.72		0.54					
	CENTRE	0.46	120.7	0.45	76.8				
	STBD INNER	0.63		0.63					
	STBD OUTER	1.93	118.6	1.50	75.6				
Summed Flow, Av.Press.		4.30	120.0	3.68	76.4				
FLOW BY GEMST		3.83		3.69					
MANIFOLD PRESSURE			126.0		82.6				

TOTAL FLOW TO BEARING

BY GEMST TOTALISER	9.69	9.36		

FLOAT OF SHAFT IN BOTTOM HALF BEARING

FORWARD DIAL GAUGE	.00029 in	.00110 in	in	in
AFTER DIAL GAUGE	.00000 in	-.00110? in	in	in
Float at Centre	.000145in	.00000 in	in	in

TABLE 20.8B

TABLE 20.8B

INCREASING MANIFOLD PRESSURES UNDER 8000 LB APPLIED LOAD

IMPOSED CONDITIONS

TEST SHEET 162 RESULTS	A		B		C		D	
VERTICAL LOADING:								
APPLIED LOAD	8000	lb	8000	lb	8000	lb	8000	lb
+ PISTON LOAD	474	lb	822	lb	936	lb	1081	lb
= TOTAL LOAD	8474	lb	8822	lb	8936	lb	9081	lb
WATER TEMPERATURE	26.4	C	26.7	C	26.1	C	26.9	C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER	1.11	20.1	1.23	31.1	1.20	35.6	1.15	40.5
FORWARD RECESSES STBD INNER AND OUTER	1.52	18.7	1.63	31.6	1.58	37.0	1.50	43.0
AFTER RECESSES PORT OUTER AND INNER	1.38	25.7	1.53	32.4	1.51	35.4	1.45	40.4
AFTER RECESSES STBD INNER AND OUTER	1.35	20.9	1.48	27.9	1.47	30.5	1.42	33.7
Summed Flow, Av.Press.	5.36	21.3	5.87	30.7	5.76	34.6	5.52	39.4
FLOW BY GEMST	5.70		6.16		6.04		5.82	
MANIFOLD PRESSURE		74.6		92.6		95.2		96.7
PISTON PRESSURE sensor		81.3		128.5		147.6		170.0
gauge		75		130		148		171
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER	0.56	77.0	0.56	126.6	0.56	146.4	0.56	169.0
PORT INNER	0.54		0.72		0.77		0.82	
CENTRE	0.45	77.0	0.45	125.8	0.46	145.9	0.46	168.0
STBD INNER	0.63		0.63		0.63		0.63	
STBD OUTER	1.50	75.7	1.93	123.6	2.15	143.1	2.45	164.9
Summed Flow, Av.Press.	3.68	76.6	4.29	125.3	4.57	145.1	4.92	167.3
FLOW BY GEMST	3.69		3.83		3.95		4.17	
MANIFOLD PRESSURE		83.1		132.6		152.8		174.9
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	9.39		9.99		9.99		9.99	
FLOAT OF SHAFT IN BOTTOM HALF BEARING								
FORWARD DIAL GAUGE	.00011	in	.00020	in	.00030	in	.00044?	in
AFTER DIAL GAUGE	-.00011	in	-.00008	in	-.00008	in	-.00002	in
Float at Centre	.00000	in	.00006	in	.00011	in	.00021	in

TABLE 20.8B CONTINUATION TABLE 20.8B

INCREASING MANIFOLD PRESSURES UNDER 8000 LB APPLIED LOAD
IMPOSED CONDITIONS

TEST SHEET 162 RESULTS		E		F		G		H	
VERTICAL LOADING:									
	APPLIED LOAD	8000	lb	8000	lb	8000	lb	8000	lb
	+ PISTON LOAD	1164	lb	1182	lb	1201	lb	1214	lb
	= TOTAL LOAD	9164	lb	9182	lb	9201	lb	9214	lb
WATER TEMPERATURE		27.1	C	26.6	C	26.6	C	27.4	C
OTHER CONDITIONS		Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	1.12	43.0	1.11	44.1	1.10	44.8	1.09	45.4
	STBD INNER AND OUTER	1.49	45.9	1.47	47.1	1.46	47.8	1.45	48.4
AFTER RECESSES	PORT OUTER AND INNER	1.41	43.5	1.38	45.4	1.36	46.8	1.34	48.0
	STBD INNER AND OUTER	1.37	37.2	1.35	40.6	1.33	42.3	1.30	44.7
Summed Flow, Av.Press.		5.39	42.4	5.31	44.3	5.25	45.4	5.18	46.6
FLOW BY GEMST		5.72		5.66		5.60		5.55	
MANIFOLD PRESSURE			97.9		97.9		98.2		98.4
PISTON PRESSURE	sensor		180.7		185.0		186.6		190.2
	gauge		182		187		190		192
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	0.56	180.7	0.58	184.8	0.59	187.3	0.61	189.2
	PORT INNER	0.87		0.92		0.96		1.02	
	CENTRE	0.47	179.3	0.48	183.8	0.48	185.9	0.49	189.2
	STBD INNER	0.63		0.63		0.63		0.63	
	STBD OUTER	2.66	174.6	2.78	178.6	2.88	180.8	2.98	182.9
Summed Flow, Av.Press.		5.19	178.2	5.39	182.4	5.54	184.7	5.73	187.1
FLOW BY GEMST		4.42		4.64		4.84		5.08	
MANIFOLD PRESSURE			185.7		189.0		194.0		195.6
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		10.14		10.30		10.44		10.63	
FLOAT OF SHAFT IN BOTTOM HALF BEARING									
FORWARD DIAL GAUGE		.00062 in		.00079 in		.00089 in		.00100 in	
AFTER DIAL GAUGE		.00001 in		.00021 in		.00028 in		.00038 in	
Float at Centre		.000315in		.00050 in		.000585in		.00069 in	

TABLE 20.8B CONTINUATION TABLE 20.8B

INCREASING MANIFOLD PRESSURES UNDER 8000 LB APPLIED LOAD
IMPOSED CONDITIONS

TEST SHEET 162 RESULTS		I		J		K		L	
VERTICAL LOADING:									
	APPLIED LOAD	8000	lb	8000	lb	8000	lb	8000	lb
	+ PISTON LOAD	1227	lb	1233	lb	1252	lb	1258	lb
	= TOTAL LOAD	9227	lb	9233	lb	9252	lb	9258	lb
WATER TEMPERATURE		26.9	C	27.4	C	26.9	C	27.0	C
OTHER CONDITIONS		Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	1.09	45.9	1.08	46.5	1.08	46.8	1.07	47.6
	STBD INNER AND OUTER	1.44	48.9	1.44	49.4	1.44	49.8	1.42	50.7
AFTER RECESSES	PORT OUTER AND INNER	1.33	49.1	1.31	50.7	1.30	51.2	1.29	51.8
	STBD INNER AND OUTER	1.29	46.6	1.27	49.6	1.26	51.8	1.26	55.9
Summed Flow, Av.Press.		5.15	47.6	5.10	49.0	5.08	49.9	5.04	51.5
FLOW BY GEMST		5.51		5.46		5.44		5.39	
MANIFOLD PRESSURE			98.2		98.5		98.8		98.9
PISTON PRESSURE	sensor		191.5		193.7		194.0		197.0
	gauge		194		195		198		199
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	0.63	190.5	0.68	192.3	0.73	193.4	0.89	195.7
	PORT INNER	1.05		1.10		1.15		1.22	
	CENTRE	0.50	190.1	0.53	192.7	0.55	194.1	0.63	196.6
	STBD INNER	0.63		0.64		0.86		1.09	
	STBD OUTER	3.05	183.8	3.15	185.8	3.25	186.8	3.48	187.2
Summed Flow, Av.Press.		5.86	188.1	6.10	190.3	6.54	191.4	7.31	193.2
FLOW BY GEMST		5.27		5.60		5.89		6.86	
MANIFOLD PRESSURE			196.4		198.9		199.3		202.1
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		10.78		11.06		11.33		12.25	
FLOAT OF SHAFT IN BOTTOM HALF BEARING									
FORWARD DIAL GAUGE		.00109	in	.00122	in	.00132	in	.00152	in
AFTER DIAL GAUGE		.00047	in	.00058	in	.00068	in	.00090	in
Float at Centre		.00078	in	.00090	in	.00100	in	.00121	in

TABLE 20.8B CONTINUATION TABLE 20.8B

INCREASING MANIFOLD PRESSURES UNDER 8000 LB APPLIED LOAD
IMPOSED CONDITIONS

TEST SHEET 162 RESULTS	M	N	O	P
VERTICAL LOADING:				
APPLIED LOAD	8000 lb	8000 lb	8000 lb	8000 lb
+ PISTON LOAD	1277 lb	1283 lb	1302 lb	1315 lb
= TOTAL LOAD	9277 lb	9283 lb	9302 lb	9315 lb
WATER TEMPERATURE	27.0 C	27.5 C	26.9 C	27.4 C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00			

PRESSURES AND FLOW RATES

TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER	1.07	48.2	1.06	48.5	1.06	49.5	1.05	49.8
FORWARD RECESSES STBD INNER AND OUTER	1.41	51.3	1.40	51.8	1.39	52.7	1.38	53.3
AFTER RECESSES PORT OUTER AND INNER	1.28	52.2	1.27	52.4	1.27	53.1	1.26	53.3
AFTER RECESSES STBD INNER AND OUTER	1.25	58.4	1.22	60.3	1.22	63.5	1.22	63.4
Summed Flow, Av.Press.	5.01	52.5	4.95	53.2	4.94	67.9	4.91	54.9
FLOW BY GEMST	5.32		5.28		5.22		5.19	
MANIFOLD PRESSURE		99.0		98.8		99.3		99.1
PISTON PRESSURE sensor		198.7		200.0		202.9		205.0
gauge		202		203		206		208

BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER	1.00	196.7	1.11	198.2	1.36	199.5	1.53	201.3
PORT INNER	1.28		1.33		1.44		1.50	
CENTRE	0.72	197.3	0.86	198.7	1.12	201.3	1.26	202.1
STBD INNER	1.24		1.39		1.67		1.84	
STBD OUTER	3.64	188.2	3.77	188.7	4.02	190.4	4.15	190.8
Summed Flow, Av.Press.	7.88	194.7	8.46	195.2	9.61	197.1	10.28	198.0
FLOW BY GEMST	7.57		8.19		9.48		10.25	
MANIFOLD PRESSURE		203.6		204.9		209.0		210.5

TOTAL FLOW TO BEARING

	M	N	O	P
BY GEMST TOTALISER	12.89	13.47	14.70	15.44

FLOAT OF SHAFT IN BOTTOM HALF BEARING

	M	N	O	P
FORWARD DIAL GAUGE	.00167 in	.00180 in	.00200 in	.00212 in
AFTER DIAL GAUGE	.00107 in	.00118 in	.00140 in	.00152 in
Float at Centre	.00137 in	.00149 in	.00170 in	.00182 in

TABLE 20.8B CONTINUATION TABLE 20.8B

INCREASING MANIFOLD PRESSURES UNDER 8000 LB APPLIED LOAD
- IMPOSED CONDITIONS

TEST SHEET 162 RESULTS	Q		R					
VERTICAL LOADING:								
APPLIED LOAD	8000	lb	8000	lb		lb		lb
+ PISTON LOAD	1334	lb	1347	lb		lb		lb
= TOTAL LOAD	9334	lb	9347	lb		lb		lb
WATER TEMPERATURE	27.4	C	27.8	C		C		C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER	1.04	50.4	1.04	51.0				
FORWARD RECESSES STBD INNER AND OUTER	1.37	53.9	1.37	54.3				
AFTER RECESSES PORT OUTER AND INNER	1.25	54.0	1.25	54.2				
AFTER RECESSES STBD INNER AND OUTER	1.21	65.4	1.20	66.1				
Summed Flow, Av.Press.	4.87	55.9	4.86	56.4				
FLOW BY GEMST	5.15		5.15					
MANIFOLD PRESSURE		99.0		99.6				
PISTON PRESSURE sensor		207.6		209.1				
PISTON PRESSURE gauge		211		213				
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER	1.79	202.4	1.94	203.6				
FWD/AFT PAIRS OF RECESSES PORT INNER	1.58		1.65					
FWD/AFT PAIRS OF RECESSES CENTRE	1.48	203.8	1.62	204.9				
FWD/AFT PAIRS OF RECESSES STBD INNER	2.09		2.25					
FWD/AFT PAIRS OF RECESSES STBD OUTER	4.34	192.6	4.48	193.4				
Summed Flow, Av.Press.	11.28	199.6	11.94	200.6				
FLOW BY GEMST	11.20		11.93					
MANIFOLD PRESSURE		215.9		217.4				
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	16.35		17.08					
FLOAT OF SHAFT IN BOTTOM HALF BEARING								
FORWARD DIAL GAUGE	.00230	in	.00240	in		in		in
AFTER DIAL GAUGE	.00170	in	.00180	in		in		in
Float at Centre	.00200	in	.00210	in		in		in

TABLE 20.9A TABLE 20.9A

DECREASING MANIFOLD PRESSURES UNDER 9000 LB APPLIED LOAD
IMPOSED CONDITIONS

TEST SHEET 163 RESULTS	A		B		C		D	
VERTICAL LOADING:								
APPLIED LOAD	9000	lb	9000	lb	9000	lb	9000	lb
+ PISTON LOAD	1435	lb	1429	lb	1416	lb	1398	lb
= TOTAL LOAD	10435	lb	10429	lb	10416	lb	10398	lb
WATER TEMPERATURE	28.4	C	28.2	C	28.8	C	28.8	C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER	1.04	55.0	1.03	54.1	1.02	53.8	1.01	53.3
FORWARD RECESSES STBD INNER AND OUTER	1.27	57.7	1.24	56.9	1.23	56.5	1.22	55.9
AFTER RECESSES PORT OUTER AND INNER	1.18	56.3	1.18	54.6	1.17	54.2	1.16	53.4
AFTER RECESSES STBD INNER AND OUTER	1.15	64.3	1.16	59.7	1.14	57.1	1.14	54.9
Summed Flow, Av.Press.	4.64	58.33	4.61	56.3	4.56	55.4	4.53	54.4
FLOW BY GEMST	4.98		4.98		4.97		4.97	
MANIFOLD PRESSURE		99.0		97.2		96.3		95.0
PISTON PRESSURE sensor		223.5		220.9		220.5		217.7
gauge		227		226		224		221
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER	2.03	217.0	1.91	214.7	1.78	214.0	1.64	212.2
PORT INNER	1.78		1.76		1.67		1.64	
CENTRE	1.70	219.6	1.56	217.9	1.44	216.8	1.32	215.4
STBD INNER	2.41		2.24		2.14		1.98	
STBD OUTER	4.71	205.3	4.59	203.7	4.53	202.7	4.44	202.0
Summed Flow, Eff.Press	12.63	215.4	12.06	213.5	11.56	212.6	11.02	211.2
FLOW BY GEMST	12.45		11.82		11.49		10.87	
MANIFOLD PRESSURE		230.9		229.1		225.9		225.4
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	17.43		16.80		16.46		15.84	
FLOAT OF SHAFT IN BOTTOM HALF BEARING								
FORWARD DIAL GAUGE	.00228 in		.00213 in		.00200 in		.00185 in	
AFTER DIAL GAUGE	.00172 in		.00167 in		.00160 in		.00153 in	
Float at Centre	.00200 in		.00190 in		.00180 in		.00169 in	

TABLE 20.9A CONTINUATION TABLE 20.9A

DECREASING MANIFOLD PRESSURES UNDER 9000 LB APPLIED LOAD
IMPOSED CONDITIONS

TEST SHEET 163 RESULTS	E	F	G	H
VERTICAL LOADING:				
APPLIED LOAD	9000 lb	9000 lb	9000 lb	9000 lb
+ PISTON LOAD	1379 lb	1359 lb	1341 lb	1334 lb
= TOTAL LOAD	10379 lb	10359 lb	10341 lb	10334 lb
WATER TEMPERATURE	28.5 C	28.6 C	29.3 C	29.2 C
OTHER CONDITIONS	Fixed for the test series, given in Table 19.0			

PRESSURES AND FLOW RATES

TOP HALF BEARING		E igpm	E psig	F igpm	F psig	G igpm	G psig	H igpm	H psig
FORWARD RECESSES	PORT OUTER AND INNER	1.00	52.4	0.99	51.3	0.98	50.6	0.98	50.3
	STBD INNER AND OUTER	1.20	54.9	1.17	53.9	1.17	53.3	1.16	52.9
AFTER RECESSES	PORT OUTER AND INNER	1.14	52.9	1.14	51.3	1.13	51.0	1.13	50.2
	STBD INNER AND OUTER	1.11	52.4	1.10	48.4	1.09	48.0	1.10	46.6
Summed Flow, Av.Press.		4.45	53.1	4.40	51.2	4.37	50.7	4.37	50.0
FLOW BY GEMST		4.94		4.93		4.93		4.91	
MANIFOLD PRESSURE			93.0		91.1		90.2		89.6
PISTON PRESSURE	sensor		214.8		211.0		208.8		208.5
	gauge		218		215		212		211

BOTTOM HALF BEARING		E igpm	E psig	F igpm	F psig	G igpm	G psig	H igpm	H psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	1.41	210.5	1.22	207.2	1.08	205.4	1.03	204.8
	PORT INNER	1.58		1.52		1.44		1.42	
	CENTRE	1.12	212.0	0.94	209.7	0.78	207.5	0.72	206.6
	STBD INNER	1.70		1.51		1.34		1.27	
	STBD OUTER	4.22	200.5	4.04	198.3	3.88	196.7	3.82	196.1
Summed Flow, Av.Press.		10.03	207.7	9.23	205.1	8.52	203.2	8.26	202.5
FLOW BY GEMST		10.02		9.10		8.33		7.99	
MANIFOLD PRESSURE			220.4		219.5		217.0		213.1

TOTAL FLOW TO BEARING

	E	F	G	H
BY GEMST TOTALISER	14.96	14.03	13.26	12.90

FLOAT OF SHAFT IN BOTTOM HALF BEARING

	E	F	G	H
FORWARD DIAL GAUGE	.00163 in	.00144 in	.00132 in	.00123 in
AFTER DIAL GAUGE	.00141 in	.00128 in	.00114 in	.00109 in
Float at Centre	.00152 in	.00136 in	.00123 in	.00116 in

TABLE 20.9A CONTINUATION TABLE 20.9A

DECREASING MANIFOLD PRESSURES UNDER 9000 LB APPLIED LOAD									
IMPOSED CONDITIONS									
TEST SHEET 163 RESULTS		I		J		K		L	
VERTICAL LOADING:									
	APPLIED LOAD	9000	lb	9000	lb	9000	lb	9000	lb
	+ PISTON LOAD	1305	lb	1303	lb	1284	lb	1271	lb
	= TOTAL LOAD	10315	lb	10303	lb	10284	lb	10271	lb
WATER TEMPERATURE		28.8	C	29.6	C	29.0	C	29.6	C
OTHER CONDITIONS		Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	0.98	49.7	0.98	48.8	0.98	48.3	0.98	47.7
	STBD INNER AND OUTER	1.16	52.1	1.16	51.3	1.16	50.9	1.17	50.4
AFTER RECESSES	PORT OUTER AND INNER	1.13	49.2	1.13	48.2	1.13	47.8	1.13	47.2
	STBD INNER AND OUTER	0.88	45.3	1.09	43.9	1.08	42.9	1.10	41.9
Summed Flow, Av.Press.		4.15	49.1	4.36	48.0	4.35	47.5	4.38	46.8
FLOW BY GEMST		4.91		4.93		4.93		4.99	
MANIFOLD PRESSURE			88.5		87.5		87.2		87.2
PISTON PRESSURE	sensor		205.1		201.0		200.0		196.7
	gauge		208		206		203		201
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	0.94	202.4	0.80	199.5	0.72	198.6	0.65	196.7
	PORT INNER	1.37		1.29		1.24		1.18	
	CENTRE	0.65	204.1	0.58	201.0	0.55	199.6	0.52	197.7
	STBD INNER	1.15		0.94		0.83		0.73	
	STBD OUTER	3.71	193.3	3.55	192.1	3.44	190.7	3.33	189.4
Summed Flow, Av.Press.		7.82	199.9	7.16	197.5	6.78	196.3	6.41	194.6
FLOW BY GEMST		7.46		6.65		6.22		5.73	
MANIFOLD PRESSURE			210.5		208.5		205.7		204.3
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		12.37		11.58		11.15		10.72	
FLOAT OF SHAFT IN BOTTOM HALF BEARING									
FORWARD DIAL GAUGE		.00114	in	.00094	in	.00083	in	.00080	in
AFTER DIAL GAUGE		.00098	in	.00082	in	.00071	in	.00058	in
Float at Centre		.00106	in	.00088	in	.00077	in	.00069	in

DECREASING MANIFOLD PRESSURES UNDER 9000 LB APPLIED LOAD
IMPOSED CONDITIONS

TEST SHEET 163 RESULTS	M		N		O		P	
VERTICAL LOADING:								
APPLIED LOAD	9000	lb	9000	lb	9000	lb	9000	lb
+ PISTON LOAD	1252	lb	1233	lb	1226	lb	1170	lb
= TOTAL LOAD	10252	lb	10233	lb	10226	lb	10170	lb
WATER TEMPERATURE	29.7	C	29.5	C	29.6	C	29.4	C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER	1.00	47.1	1.01	46.6	1.02	45.9	1.05	44.2
FORWARD RECESSES STBD INNER AND OUTER	1.19	49.7	1.20	49.2	1.22	48.5	1.26	46.8
AFTER RECESSES PORT OUTER AND INNER	1.14	46.4	1.16	46.0	1.17	45.3	1.21	43.5
AFTER RECESSES STBD INNER AND OUTER	1.11	49.5	1.12	39.7	1.15	38.4	1.18	36.2
Summed Flow, Av.Press.	4.44	48.2	4.49	45.4	4.56	44.5	4.70	42.7
FLOW BY GEMST	5.03		5.08		5.11		5.24	
MANIFOLD PRESSURE		87.4		87.7		87.5		87.7
PISTON PRESSURE sensor		195.0		194.2		191.0		184.0
gauge		198		195		194		185
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER	0.60	194.1	0.58	193.0	0.57	190.7	0.56	183.8
PORT INNER	1.10		1.05		1.00		0.94	
CENTRE	0.49	195.5	0.48	193.0	0.47	190.5	0.46	183.5
STBD INNER	0.68		0.66		0.64		0.62	
STBD OUTER	3.19	187.6	3.09	185.8	2.98	184.1	2.81	177.8
Summed Flow, Av.Press.	6.06	192.4	5.86	190.6	5.66	188.4	5.39	181.7
FLOW BY GEMST	5.28		5.02		4.79		4.54	
MANIFOLD PRESSURE		203.1		200.0		196.3		188.8
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	10.31		10.10		9.90		9.78	
FLOAT OF SHAFT IN BOTTOM HALF BEARING								
FORWARD DIAL GAUGE	.00052 in		.00041 in		.00030 in		.00024 in	
AFTER DIAL GAUGE	.00040 in		.00029 in		.00012 in		.00010 in	
Float at Centre	.00046 in		.00035 in		.00021 in		.00017 in	

TABLE 20.9A CONTINUATION TABLE 20.9A

DECREASING MANIFOLD PRESSURES UNDER 9000 LB APPLIED LOAD
IMPOSED CONDITIONS

TEST SHEET 163 RESULTS	Q		R		S		T	
VERTICAL LOADING:								
APPLIED LOAD	9000	lb	9000	lb	9000	lb	9000	lb
+ PISTON LOAD	1075	lb	961	lb	670	lb		lb
= TOTAL LOAD	10075	lb	9961	lb	9670	lb		lb
WATER TEMPERATURE	29.4	C	29.6	C	28.8	C		C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES								
TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER	1.10	40.9	1.19	36.9	1.28	26.5		
FORWARD RECESSES STBD INNER AND OUTER	1.34	43.1	1.47	38.5	1.61	25.9		
AFTER RECESSES PORT OUTER AND INNER	1.26	41.8	1.34	40.2	1.42	32.3		
AFTER RECESSES STBD INNER AND OUTER	1.22	33.9	1.30	32.4	1.37	26.8		
Summed Flow, Av.Press.	4.92	39.9	5.30	37.0	5.68	27.9		
FLOW BY GEMST	5.39		5.66		6.02			
MANIFOLD PRESSURE		88.0		89.9		85.9		
PISTON PRESSURE sensor		168.8		151.1		106.2		
gauge		170		152		106		
BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER	0.56	168.2	0.56	149.9	0.56	103.4		
PORT INNER	0.89		0.83		0.67			
CENTRE	0.46	168.1	0.46	149.4	0.45	102.9		
STBD INNER	0.61		0.61		0.42			
STBD OUTER	2.57	163.9	2.31	146.3	1.78	101.3		
Summed Flow, Av.Press.	5.09	166.7	4.77	148.5	3.88	102.5		
FLOW BY GEMST	4.31		4.07		3.78			
MANIFOLD PRESSURE		174.1		156.6		108.7		
TOTAL FLOW TO BEARING								
BY GEMST TOTALISER	9.70		9.73		9.80			
FLOAT OF SHAFT IN BOTTOM HALF BEARING								
FORWARD DIAL GAUGE	.00013 in		.00004 in		-.000017in		-.000012in	
AFTER DIAL GAUGE	.00008 in		-.00013 in		-.000023in		-.000003in	
Float at Centre	.000105in		-.000045in		-.000020in		-.000007in	

TABLE 20.9B

TABLE 20.9B

INCREASING MANIFOLD PRESSURES UNDER 9000 LB APPLIED LOAD

IMPOSED CONDITIONS

TEST SHEET 163 RESULTS		A		B		C		D	
VERTICAL LOADING:									
	APPLIED LOAD	9000	lb	9000	lb	9000	lb	9000	lb
	+ PISTON LOAD	588	lb	973	lb	1094	lb	1170	lb
	= TOTAL LOAD	9588	lb	9973	lb	10094	lb	10170	lb
WATER TEMPERATURE		27.1	C	27.2	C	27.2	C	27.0	C
OTHER CONDITIONS		Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	1.16	23.1	1.17	36.3	1.13	40.4	1.10	42.9
	STBD INNER AND OUTER	1.59	22.3	1.57	38.2	1.51	43.1	1.47	46.3
AFTER RECESSES	PORT OUTER AND INNER	1.43	29.3	1.50	36.8	1.45	40.8	1.41	43.6
	STBD INNER AND OUTER	1.39	24.6	1.46	32.3	1.40	35.0	1.37	36.9
Summed Flow, Av.Press.		5.57	24.9	5.70	35.9	5.49	39.8	5.35	42.4
FLOW BY GEMST		5.91		5.95		5.80		5.70	
MANIFOLD PRESSURE			82.1		95.6		97.1		97.7
PISTON PRESSURE	sensor		93.5		152.5		170.6		182.1
	gauge		93		154		173		185
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	0.56	90.0	0.56	151.4	0.56	170.0	0.56	181.9
	PORT INNER	0.62		0.79		0.83		0.86	
	CENTRE	0.46	89.7	0.46	150.5	0.46	169.7	0.46	181.2
	STBD INNER	0.65		0.65		0.65		0.66	
	STBD OUTER	1.59	88.7	2.19	148.2	2.40	166.4	2.57	177.5
Summed Flow, Av.Press.		3.88	89.5	4.65	150.0	4.90	168.7	5.11	180.2
FLOW BY GEMST		3.74		3.98		4.17		4.30	
MANIFOLD PRESSURE			96.2		157.2		176.8		187.4
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		9.65		9.93		9.97		10.00	
FLOAT OF SHAFT IN BOTTOM HALF BEARING									
FORWARD DIAL GAUGE		.00003 in		.00020 in		.00030 in		.00037 in	
AFTER DIAL GAUGE		-.00018 in		-.00012 in		-.00010 in		-.00007 in	
Float at Centre		-.000075in		.00004 in		.00010 in		.00015 in	

TABLE 20.9B CONTINUATION TABLE 20.9B

INCREASING MANIFOLD PRESSURES UNDER 9000 LB APPLIED LOAD
IMPOSED CONDITIONS

TEST SHEET 163 RESULTS	E		F		G		H	
VERTICAL LOADING:								
APPLIED LOAD	9000	lb	9000	lb	9000	lb	9000	lb
+ PISTON LOAD	1246	lb	1290	lb	1309	lb	1328	lb
= TOTAL LOAD	10246	lb	10290	lb	10309	lb	10328	lb
WATER TEMPERATURE	27.7	C	27.8	C	28.1	C	27.7	C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00							

PRESSURES AND FLOW RATES

TOP HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES PORT OUTER AND INNER	1.07	45.8	1.06	47.4	1.05	48.2	0.67	49.2
FORWARD RECESSES STBD INNER AND OUTER	1.43	49.6	1.42	51.3	1.40	52.3	1.15	53.1
AFTER RECESSES PORT OUTER AND INNER	1.36	46.7	1.32	49.4	1.29	51.1	0.52	53.4
AFTER RECESSES STBD INNER AND OUTER	1.33	40.3	1.28	44.5	1.26	47.6	3.29	51.9
Summed Flow, Av.Press.	5.19	45.6	5.08	48.1	5.00	49.8	5.63	51.9
FLOW BY GEMST	5.62		5.52		5.45		5.34	
MANIFOLD PRESSURE		98.5		99.2		99.1		99.5
PISTON PRESSURE sensor		195.7		200.0		203.8		207.4
gauge		197		204		207		210

BOTTOM HALF BEARING	igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES PORT OUTER	0.57	195.1	0.59	200.5	0.61	203.9	0.67	207.5
PORT INNER	0.92		1.00		1.06		1.15	
CENTRE	0.47	193.8	0.48	199.8	0.49	203.8	0.52	207.8
STBD INNER	0.68		0.71		0.73		0.80	
STBD OUTER	2.81	189.1	2.97	195.7	3.11	197.4	3.29	199.8
Summed Flow, Av.Press.	5.45	192.7	5.75	198.7	6.00	201.7	6.43	205.0
FLOW BY GEMST	4.60		4.92		5.22		5.72	
MANIFOLD PRESSURE		201.4		208.8		212.5		211.9

TOTAL FLOW TO BEARING

	E	F	G	H
BY GEMST TOTALISER	10.22	10.44	10.67	11.06

FLOAT OF SHAFT IN BOTTOM HALF BEARING

	E	F	G	H
FORWARD DIAL GAUGE	.00086 in	.00078 in	.00092 in	.00111 in
AFTER DIAL GAUGE	.00006 in	.00018 in	.00028 in	.00043 in
Float at Centre	.00046 in	.00048 in	.00060 in	.00077 in

TABLE 20.9B CONTINUATION TABLE 20.9B

INCREASING MANIFOLD PRESSURES UNDER 9000 LB APPLIED LOAD

IMPOSED CONDITIONS

TEST SHEET 163 RESULTS	I	J	K	L
VERTICAL LOADING:				
APPLIED LOAD	9000 lb	9000 lb	9000 lb	9000 lb
+ PISTON LOAD	1359 lb	1366 lb	1379 lb	1397 lb
= TOTAL LOAD	10359 lb	10366 lb	10379 lb	10397 lb
WATER TEMPERATURE	28.5 C	28.2 C	28.5 C	28.0 C
OTHER CONDITIONS	Fixed for the test series, given in Table 20.00			

PRESSURES AND FLOW RATES

TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	1.03	50.2	1.02	50.7	1.01	51.1	1.01	51.8
	STBD INNER AND OUTER	1.36	54.0	1.35	54.6	1.33	55.3	1.33	56.0
AFTER RECESSES	PORT OUTER AND INNER	1.25	54.9	1.23	55.3	1.22	55.5	1.21	56.1
	STBD INNER AND OUTER	1.20	56.2	1.20	59.1	1.19	60.4	1.18	62.9
Summed Flow, Av.Press.		4.84	53.8	4.80	54.9	4.75	55.6	4.73	56.7
FLOW BY GEMST		5.31		5.21		5.18		5.14	
MANIFOLD PRESSURE			99.9		99.7		99.3		100.0
PISTON PRESSURE	sensor		210.4		212.8		215.0		217.6
	gauge		215		216		218		221

BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
	PORT OUTER	0.76	209.9	0.88	211.9	0.95	213.3	1.07	215.3
FWD/AFT	PORT INNER	1.23		1.30		1.34		1.41	
PAIRS OF	CENTRE	0.57	210.4	0.62	213.2	0.67	214.0	0.80	216.3
RECESSES	STBD INNER	0.93		1.10		1.21		1.40	
	STBD OUTER	3.48	201.9	3.66	203.3	3.77	203.9	3.94	205.9
Summed Flow, Av.Press.		6.97	207.4	7.56	209.5	7.94	210.4	8.62	212.5
FLOW BY GEMST		6.34		7.08		7.48		8.26	
MANIFOLD PRESSURE			216.6		218.8		219.8		225.9

TOTAL FLOW TO BEARING

	I	J	K	L
BY GEMST TOTALISER	11.65	12.29	12.66	13.40

FLOAT OF SHAFT IN BOTTOM HALF BEARING

	I	J	K	L
FORWARD DIAL GAUGE	.00128 in	.00142 in	.00150 in	.00166 in
AFTER DIAL GAUGE	.00060 in	.00076 in	.00083 in	.00100 in
Float at Centre	.00094 in	.00109 in	.001165in	.00133 in

TABLE 20.9B CONTINUATION TABLE 20.9B

INCREASING MANIFOLD PRESSURES UNDER 9000 LB APPLIED LOAD

- IMPOSED CONDITIONS

TEST SHEET 163 RESULTS		M		N		O		P	
VERTICAL LOADING:									
	APPLIED LOAD	9000	lb	9000	lb	9000	lb	9000	lb
	+ PISTON LOAD	1416	lb	1416	lb	1435	lb	1448	lb
	= TOTAL LOAD	10416	lb	10416	lb	10435	lb	10448	lb
WATER TEMPERATURE		28.8	C	28.7	C	29.2	C	29.5	C
OTHER CONDITIONS		Fixed for the test series, given in Table 20.00							
PRESSURES AND FLOW RATES									
TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	1.00	52.5	0.99	52.3	0.99	53.2	0.99	53.6
	STBD INNER AND OUTER	1.33	56.9	1.31	56.9	1.31	58.1	1.31	58.6
AFTER RECESSES	PORT OUTER AND INNER	1.20	56.7	1.20	55.8	1.19	57.1	1.19	57.5
	STBD INNER AND OUTER	1.17	66.7	1.16	65.8	1.15	68.8	1.15	69.6
Summed Flow, Av.Press.		4.70	58.2	4.66	57.7	4.64	59.3	4.64	59.8
FLOW BY GEMST		5.08		5.05		5.05		5.02	
MANIFOLD PRESSURE			100.0		99.0		100.0		100.3
PISTON PRESSURE	sensor		219.0		219.7		223.3		225.2
	gauge		224		224		227		229
BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	1.26	216.7	1.32	216.9	1.54	219.0	1.72	221.3
	PORT INNER	1.50		1.51		1.59		1.65	
	CENTRE	1.02	218.3	1.08	218.5	1.27	221.0	1.42	222.0
	STBD INNER	1.64		1.69		1.93		2.11	
	STBD OUTER	4.16	206.8	4.20	206.7	4.37	208.0	4.51	209.3
Summed Flow, Av.Press.		9.58	213.9	9.80	214.0	10.70	216.0	11.41	217.5
FLOW BY GEMST		9.33		9.62		10.50		11.23	
MANIFOLD PRESSURE			228.0		228.1		229.7		231.6
TOTAL FLOW TO BEARING									
BY GEMST TOTALISER		14.41		14.67		15.55		16.25	
FLOAT OF SHAFT IN BOTTOM HALF BEARING									
FORWARD DIAL GAUGE		.00181	in	.00180	in	.00198	in	.00210	in
AFTER DIAL GAUGE		.00117	in	.00118	in	.00132	in	.00144	in
Float at Centre		.00149	in	.00149	in	.00165	in	.00177	in

TABLE 20.9B CONTINUATION TABLE 20.9B

INCREASING MANIFOLD PRESSURES UNDER 9000 LB APPLIED LOAD

IMPOSED CONDITIONS

TEST SHEET 163 RESULTS		Q		R		S		T	
VERTICAL LOADING:									
	APPLIED LOAD	9000	lb	9000	lb	9000	lb	9000	lb
	+ PISTON LOAD	1473	lb	1492	lb		lb		lb
	= TOTAL LOAD	10473	lb	10492	lb		lb		lb
WATER TEMPERATURE		29.0	C	29.7	C		C		C
OTHER CONDITIONS		Fixed for the test series, given in Table 20.00							

PRESSURES AND FLOW RATES

TOP HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FORWARD RECESSES	PORT OUTER AND INNER	0.98	54.5	0.97	54.9				
	STBD INNER AND OUTER	1.30	59.3	1.28	59.8				
AFTER RECESSES	PORT OUTER AND INNER	1.17	57.9	1.16	58.3				
	STBD INNER AND OUTER	1.15	70.7	1.12	71.9				
Summed Flow, Av.Press.		4.60	60.6	4.53	61.2				
FLOW BY GEMST		5.00		4.93					
MANIFOLD PRESSURE			100.0		99.9				
PISTON PRESSURE	sensor		227.9		230.3				
	gauge		233		236				

BOTTOM HALF BEARING		igpm	psig	igpm	psig	igpm	psig	igpm	psig
FWD/AFT PAIRS OF RECESSES	PORT OUTER	2.01	222.4	2.25	223.5				
	PORT INNER	1.74		1.83					
	CENTRE	1.69	224.0	1.96	225.8				
	STBD INNER	2.38		2.62					
	STBD OUTER	4.75	210.3	4.96	210.8				
Summed Flow, Av.Press.		12.51	218.9	13.62	220.0				
FLOW BY GEMST		12.40		13.48					
MANIFOLD PRESSURE			234.5		238.5				

TOTAL FLOW TO BEARING

	Q	R	S	T
BY GEMST TOTALISER	17.40	18.41		

FLOAT OF SHAFT IN BOTTOM HALF BEARING

	Q	R	S	T
FORWARD DIAL GAUGE	.00228 in	.00244 in	.00004 in	in
AFTER DIAL GAUGE	.00165 in	.00182 in	-.00010 in	in
Float at Centre	.001965in	.00213 in	-.00003 in	in